

SERVICE MANUAL

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727

SPECTRUM ANALYZER



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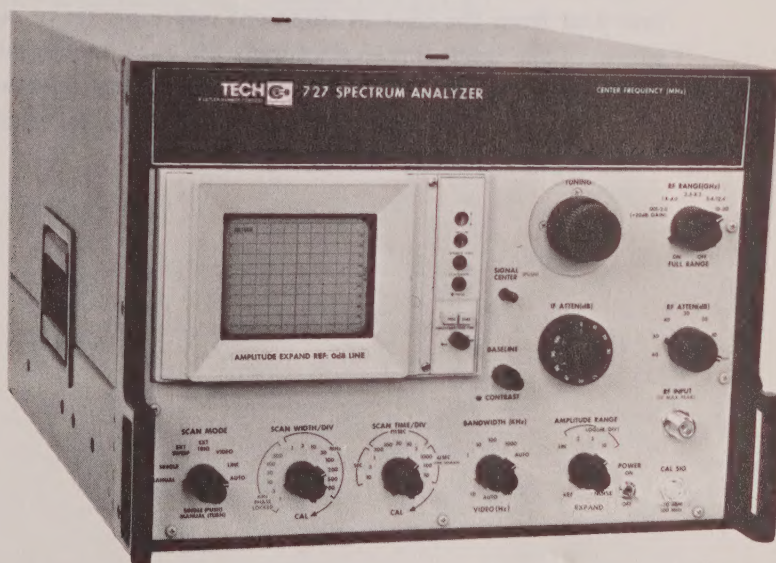
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WARRANTY

Except for tubes, fuses, and batteries which carry no warranty, Cutler-Hammer, in connection with equipment sold, agrees to correct any defect in workmanship or material which may develop during the period of one year from the date of shipment under proper or normal use and not in excess of the original manufacturer's life expectancy ratings, by its option to repair or replace, FOB point of shipment, the defective part or parts, and such correction shall constitute a fulfillment of all Cutler-Hammer liabilities in respect to said apparatus.

FOREWORD

The AILTECH 727 Spectrum Analyzer handbook information is divided into two applicable manuals. These are:

OPERATING MANUAL

Contains general information relating to the operational characteristics of the instrument.

SERVICE MANUAL

Contains all information required to service and maintain the instrument. Includes schematic diagrams, troubleshooting procedures, and replaceable parts list.

ADDITIONAL SERVICE

Additional service information can be made available by calling AILTECH at 516-595-6478

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WARNING**SAFETY**

To avoid the possibility of injury or death, the following precautions must be followed before the instrument is switched on:

- If this instrument is to be energized via an autotransformer for voltage reduction, make sure that the common terminal is connected to the earthed pole of the power source.
- The power cable plug shall be inserted into a socket outlet provided with a protective earth contact. The protective action must not be negated by the use of an extension cord without a protective conductor (grounding).
- Before switching on the instrument, the protective earth terminal of the instrument must be connected to a protective conductor of the power cord. This is accomplished by ensuring that the instrument's internal earth terminal is correctly connected to the instrument's chassis and that the power cord is wired correctly.
- Whenever it is likely that the protection has been impaired, the instrument must be made inoperative and be secured against any unintended operation.
- Any interruption of the protective (grounding) conductor inside or outside the instrument or disconnection of the protective earth terminal is likely to make the instrument dangerous. Intentional interruption is prohibited.

HIGH VOLTAGE

- Any adjustment, maintenance, and repair of the opened instrument under voltage should be avoided as much as possible and, if inevitable, should be carried out only by a skilled person who is aware of the hazard involved.
- Exercise extreme care when servicing the display unit. Voltages in excess of 7000 volts are used.
- Handle CRT's very carefully to avoid implosion.
- Capacitors inside the instrument may still be charged even if the instrument has been disconnected from its source of supply.

FUSES

- Fuses are used in both sides of the AC line. Make sure that only fuses with the required rated current and of the specified type (normal blow, time delay, etc.) are used for replacement. The use of repaired fuses and the short-circuiting of fuse-holders must be avoided. Remove line cord before changing fuses.

CAUTION

GROUNDING

- Any interruption of the protective (grounding) conductor inside or outside the instrument is likely to cause damage to the instrument. To avoid damage, this instrument and all line powered devices connected to it must be connected to the same earth ground.

LINE VOLTAGE

- Be sure to select the correct fuse rating for the selected line voltage. Fuse ratings are listed on the instrument near the fuse holders.
- To prevent damage to the instrument, make the line voltage selection before connecting line power. Also ensure that the line power cord is connected to a line power socket that is provided with a protective earth contact.

SAFETY

- To avoid the possibility of damage to test equipment, read completely through each section before starting it. Make any preliminary control settings necessary for correct test equipment operation.

SEMI-RIGID COAX

- Do not torque the RF connectors to more than 5 inch-pounds.



AILTECH 727 Series Spectrum Analyzers

CHAPTER 1

GENERAL INFORMATION

1-1. SCOPE

This manual provides service information for the AILTECH 727 Spectrum Analyzer. Information relative to ordering parts is also included. A separate manual is provided for the operation procedures for the Spectrum Analyzer as is explained in the Foreword.

1-2. POWER REQUIREMENTS

The AILTECH 727 Spectrum Analyzer is operated on either 115 or 230 Vac at 50 to 60 Hz. The 115/230-volt slide switch on the rear of the instrument must be in the correct position to avoid damage to the instrument. When shipped, the instrument is set for the line voltage anticipated at the destination. This should be verified before applying power. Fuses should be changed when changing line voltages. The power requirement is about 220 watts.

1-3. GROUNDING REQUIREMENTS

To protect operating personnel, the National Electrical Manufacturer's Association (NEMA) recommends that the instrument panel and cabinet be grounded. This instrument is equipped with a three conductor power cable which, when plugged into an appropriate receptacle, grounds the instrument. The offset pin on the power cable three-prong connector is the ground wire.

1-4. PACKAGE DESCRIPTION

The AILTECH 727 Spectrum Analyzer is designed for ease of servicing. Most adjustments for calibration and alignment are accessible with top cover removed. All subassemblies have modular construction for easy service and repair.

The AILTECH 727 Spectrum Analyzer has four principle subassemblies. These are: (1) the display module which can be independently removed through the front panel; (2) the RF deck which swings out from under the unit when the bottom cover is removed; (3) the main frame which houses most video boards, the low voltage power supply, the log IF amplifier; and (4) the front panel and harness assembly. This construction makes all subassemblies accessible to the service personnel. Figure 1-1 shows the location of the subassemblies within the instrument.

1-5. OPERATING ENVIRONMENT

The operating environment should be within the following limitations:

Temperature
Humidity

0° to 55° C
95% RH @ 40° C

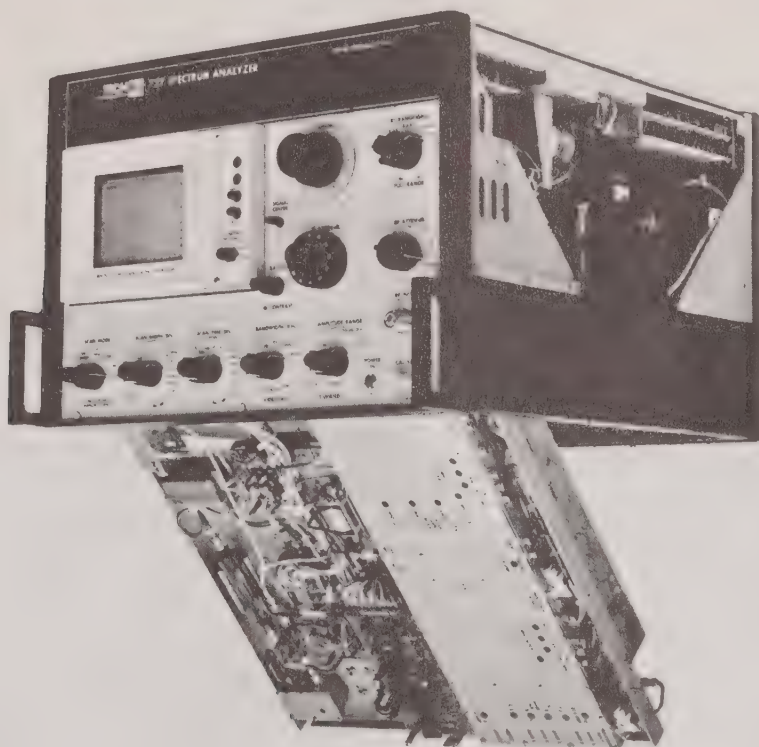


Figure 1-1. AILTECH 727 Spectrum Analyzer Subassembly Location

A forced air cooling system is used to maintain the operating temperature inside the instrument. The air intake and filter is located on the rear panel and should be cleaned regularly.

When operating the instrument, choose a location that provides at least 3 inches of clearance between the instrument and any obstruction.

1-6. PREPARATION FOR USE

1-7. UNPACKING

No special instructions are necessary when unpacking the AILTECH 727 Spectrum Analyzer. Reasonable care should be taken in removal of the unit from the shipping container.

1-8. INSPECTION FOR SHIPPING DAMAGE

Inspect the shipping container for signs of shipping damage. If the container is damaged, a detailed examination of the Spectrum Analyzer is required. Remove the upper and lower cover plates and examine the interior for damage, including components jarred loose during shipment.

CAUTION

The AILTECH 727 Spectrum Analyzer should not be operated with LINE VOLTAGE SELECT switch on the rear panel in the wrong position. Operation with the switch in the wrong position may cause incorrect operation or damage to the Spectrum Analyzer.

1-9. INSTALLATION

The AILTECH 727 Spectrum Analyzer can be operated from either 115 volts or 230 volts. Determine that the LINE VOLTAGE SELECT switch on the upper left corner of the rear panel is correctly set. If it is necessary to change the position of the LINE VOLTAGE SELECT switch, proceed as follows:

- a. Disconnect power cable from connector P1.
- b. Remove the two screws holding the locking plate in place.
- c. Slide the switch to the correct position.
- d. Reinstall the locking plate removed in step b.

Check that the correct fuses are installed: for 115 volts, install 3A slo-blow fuses; for 230 volts, install 1.5A slo-blow fuses. Connect power cable to connector P1 on the rear of the panel. Ensure that the supplied coaxial patch cable is connected between 21.4 INPUT and 21.4 OUTPUT jacks.

1-10. COOLING

The cooling fan mounted on the rear panel of the Spectrum Analyzer transports cool air through the device, maintaining correct temperatures within the unit.

1-11. PREPARATION FOR RESHIPMENT**1-12. PACKING**

The Spectrum Analyzer shall be packaged in a manner that affords maximum protection against shock, vibration, and humidity.

1-13. OPTIONS (002, 003 AND 045)

Certain optional circuitry is available with all models of the 727 Spectrum Analyzer. These options are described in detail in the Appendix.

CHAPTER 2

THEORY OF OPERATION

2-1. BASIC OPERATING PRINCIPLES

The AILTECH 727 Spectrum Analyzer consists of a superheterodyne receiver and a calibrated CRT display. The receiver may be manually tuned to a fixed frequency or swept tuned through a selected frequency interval. Figure 2-1 is the simplified block diagram of the instrument.

The linear ramp generator provides the horizontal deflection signal for the CRT and the tuning voltages for the preselector and voltage-tuned local oscillator. The inherent linearity of the YIG-tuned preselector and voltage-tuned local oscillator ensure that frequency tuning is linear with respect to horizontal deflection of the CRT. The same linearity also ensures that the preselector frequency is maintained at a fixed interval from the voltage-tuned local oscillator frequency, that interval being the first intermediate frequency.

When a signal is passed through the preselector, it is mixed with the output of the voltage-tuned local oscillator to provide an output at the intermediate frequency. The signal is amplified, detected, and applied to the vertical deflection plates of the CRT. Since the horizontal deflection is proportional to frequency, the display is a plot of amplitude versus frequency of the applied signal.

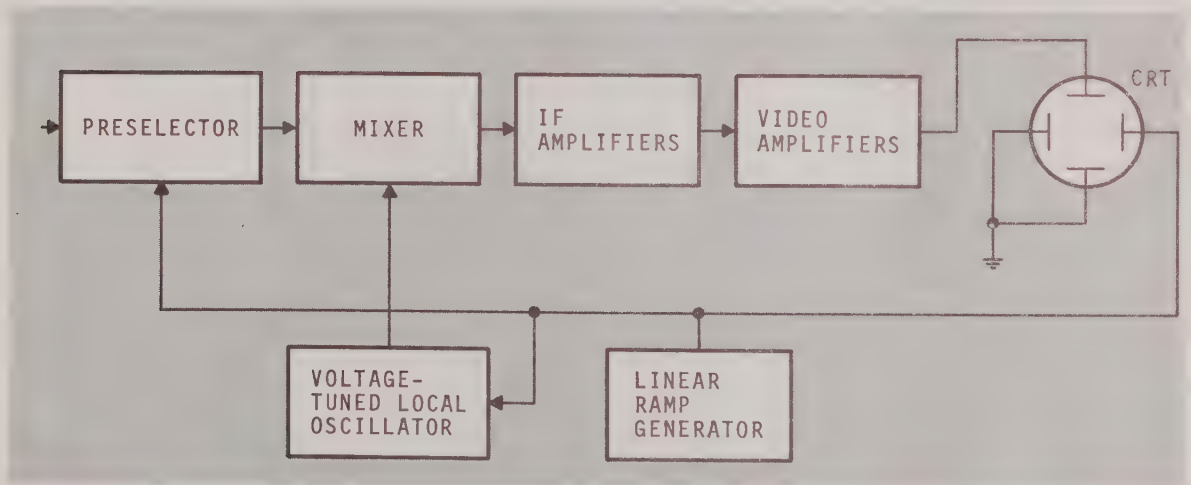


Figure 2-1. AILTECH 727 Spectrum Analyzer Simplified Block Diagram

2-2. THEORY OF OPERATION

Figure 2-2 is the block diagram of the AILTECH 727 Spectrum Analyzer.

The signal is first applied to the RF attenuator. The RF attenuator provides 60 dB of attenuation in 10-dB steps. It is used to reduce the signal level so that spurious signal generation within the AILTECH 727 is minimized. In general, the signal at the output of the RF attenuator should not exceed -10 dBm. For maximum sensitivity, it is left in the 0-dB position.

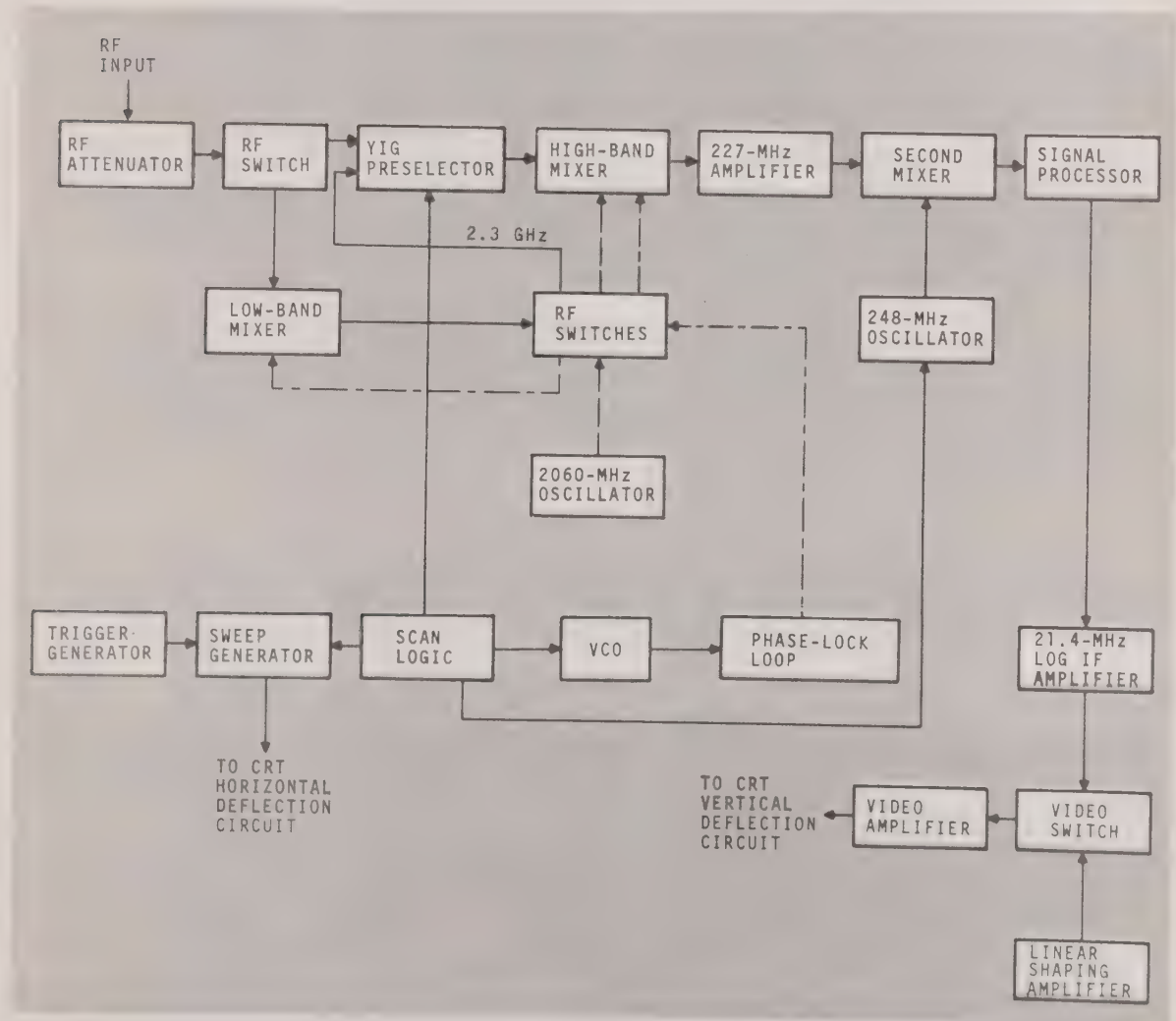


Figure 2-2. AILTECH 727 Spectrum Analyzer Functional Block Diagram

Following the RF attenuator is one section of the RF RANGE switch. If the low band (0.001 to 2.0 GHz) is selected, the signal is mixed with the output of the swept VCO and up-converted to 2.29 GHz. The YIG preselector is fixed-tuned to this frequency. The signal is then applied to the high-band mixer and mixed with a crystal-controlled 2060-MHz signal to derive the 227 MHz first intermediate frequency. If any other RF range is selected, the signal is applied directly to the YIG preselector and mixed with the output of the swept VCO in the high-band mixer.

The preselector is a YIG filter capable of being electronically tuned from 1.8 to 20 GHz. Offset and sweep logic circuits in the scan logic ensure that the center frequency of the voltage-tuned local oscillator is always 227 MHz greater than the YIG preselector frequency. The purpose of the YIG preselector is to prevent the generation of on-screen image signals without having to resort to microwave intermediate frequencies or a large number of narrow bands to ensure a single mode of mixing within each band.

The VCO is capable of being electronically tuned from 1.7 to 4.3 GHz. When the SCAN WIDTH switch is in a MHz position, the VCO is swept over the selected scan width. When the SCAN WIDTH switch is in a kHz position, the VCO is automatically stabilized and operates at a fixed frequency. Scanning is then done by the 248-MHz oscillator.

After down-conversion, the signal is amplified and applied to the second mixer. This mixer is driven by the 248-MHz oscillator and provides an output at 21.4 MHz. When the SCAN WIDTH switch is in a MHz position, the second LO operates at a fixed frequency. When a kHz scan is selected, this oscillator is swept over the selected interval.

The 21.4-MHz signal is then applied to a signal processor made up of an IF attenuator, an IF bandwidth selector, and an automatic gain compensation network. The attenuator is used to adjust the amplitude of the display. It consists of two sections, one providing 100 dB in 10-dB steps, the other providing 10 dB in 1-dB steps. Four IF bandwidths are provided. These are determined by four sets of filters selectable from the front panel.

The AILTECH 727 Spectrum Analyzer utilizes harmonic mixing to obtain operation at the three higher RF ranges (3.3 to 20 GHz). The conversion efficiency of the first mixer is poorer in these harmonic mixing modes than for fundamental mixing. The automatic gain compensation network senses the RF range to which the AILTECH 727 is tuned and inserts or removes attenuation to maintain the overall gain constant with frequency.

Signal amplitudes are usually measured in logarithmic units (dB). Because of this, final IF amplification is provided by a wide-range 21.4-MHz log amplifier. This amplifier employs the successive limiting technique and converts linear IF to logarithmic video. The conversion is such that the amplifier's response is within ± 2 dB over a full 100-dB dynamic range.

If the AMPLITUDE RANGE switch on the front panel is set to one of the LOG positions, the output of the 21.4-MHz log IF amplifier is applied directly to the video amplifier. However, some measurements are more convenient with a linear display. Placing the AMPLITUDE RANGE switch in the LIN (linear) position routes the signal through a shaping amplifier that restores the linear amplitude response.

Additional filtering is provided in the video amplifier. The signal is then further amplified and applied to the vertical deflection plates of the CRT.

2-3. CONTROLS AND INDICATORS

Figure 2-3 identifies and describes the controls and indicators on the front panel of the AILTECH 727. Figure 2-4 identifies and describes the controls, input and output jacks, and fuses on the rear panel.

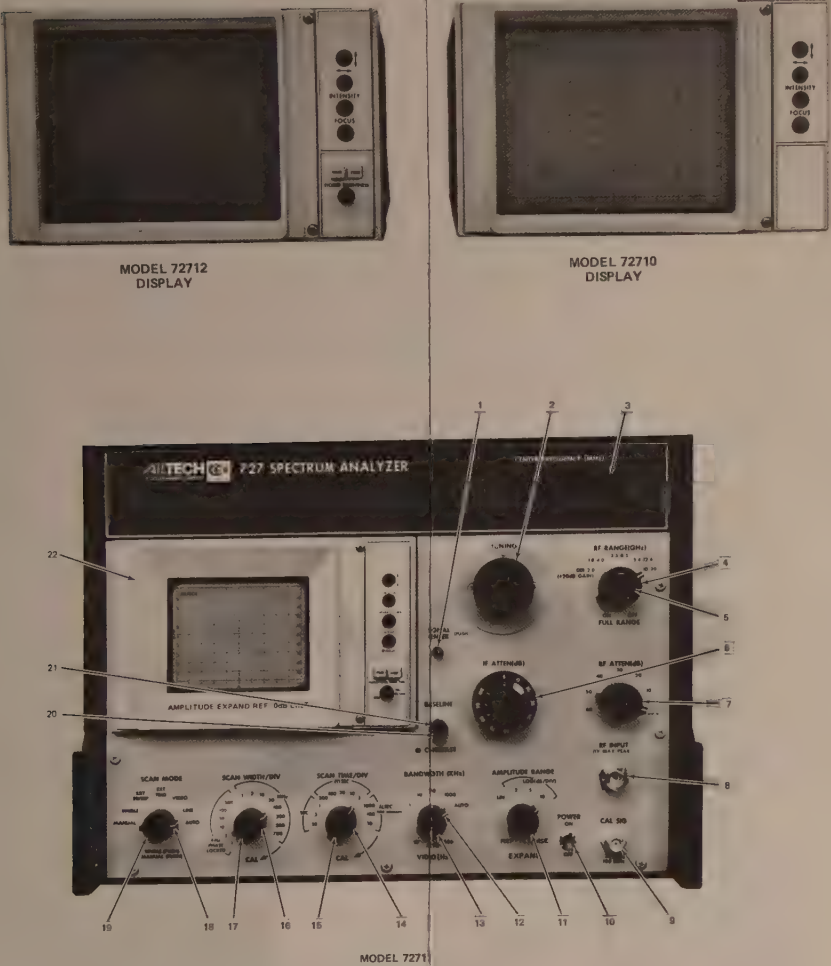


Figure 2-3. Front Panel Controls and Indicators
(Sheet 1 of 2)

Reference No.	Nomenclature and Function
1	SIGNAL CENTER control Push-to-turn continuous control adjusts the center frequency in MHz increments when operating at kHz scan widths. Acts as a fine frequency vernier and amplitude peaker by allowing user direct access to main LO and pre-selector. This eliminates any amplitude degradation caused by poor tracking of the preselector with the main LO.
2	TUNING control Sets the center frequency of the interval being scanned. Outer knob is for coarse tuning; inner-knob is mechanically reduced for fine tuning. Sets marker frequency in FULL RANGE scan mode.
3	CENTER FREQUENCY (MHz) readout Indicates center frequency of the interval being scanned or marker frequency in FULL RANGE scan mode.
4	RF RANGE (GHz) switch Switch selects frequency limits of the spectrum being scanned as follows: 0.001 - 2.0 GHz 1.8 - 4.0 GHz 3.3 - 8.3 GHz 5.4 - 12.4 GHz 10.0 - 20.0 GHz
5	FULL RANGE switch Two-position switch concentric with the RF RANGE (GHz) switch. In the ON position the analyzer scans the entire spectrum indicated by the RF RANGE (GHz) switch setting. In the OFF position, spectrum width reverts to the SCAN WIDTH/DIV switch setting.
6	IF ATTEN (dB) switch Step attenuator adjusts display amplitude. Outer ring provides 100-dB attenuation in 10 -dB steps; inner knob provides 10-dB attenuation in 1-dB steps.
7	RF ATTEN (dB) switch Attenuates RF input signal. Provides 60-dB attenuation in 10-dB steps.
8	RF INPUT jack Precision type N female connector: input for signals in the range from 0.001 to 20.0 GHz.
9	CALIBRATE SIGNAL Supplies a -30 dBm $\pm$.5 dB signal @ 100 MHz.

10	POWER switch
	On-off switch for primary power.
11	AMPLITUDE RANGE switch
	Four-position switch selects logarithmic amplitude display (LOG) with sensitivities of 2, 5, or 10 dB/DIV of vertical deflection or linear amplitude display (LIN).
12	BANDWIDTH (kHz) switch
	Five-position switch manually selects IF bandwidths of 1, 10, 100, and 1000 kHz, or, in the AUTO position, the analyzer automatically selects the best available IF bandwidth for the combination of SCAN TIME/DIV and SCAN WIDTH/DIV in use.
13	BANDWIDTH (kHz) VIDEO switch
	Three-position switch, concentric with the BANDWIDTH (kHz) switch for manual selection of the bandwidths of 10 and 500 Hz. or, in the AUTO position, the analyzer automatically selects 5 kHz, 25 kHz, 150 kHz, 1000 kHz or whichever is the best available bandwidth for the IF bandwidth in use.
14	SCAN TIME/DIV switch
	Eleven-position switch selects eight calibrated scan times from 10 seconds to 300 msec per division or, three calibrated sweep times of 10, 100, and 1000 μ sec per division for zero scan width (time domain) displays.
15	SCAN TIME vernier
	Concentric control for interpolation. Scan or sweep times are calibrated when the vernier is fully clockwise.
16	SCAN WIDTH/DIV switch
	Fourteen-position switch selects calibrated scan widths from 1 kHz to 700 MHz per division in a 1, 3, 10 sequence and 200, 500, and 700 MHz per division.
17	SCAN WIDTH vernier
	Concentric control continuously adjusts scan width from zero to the setting of the SCAN WIDTH/DIV switch. Scan widths are calibrated when the vernier is fully clockwise.
18	SCAN MODE switch
	Seven-position switch selects trigger mode for internal scan or an external sweep signal as follows:
	AUTO: Recurrent scan, internally generated
	LINE: Scan triggered by the ac line
	VIDEO: Scan triggered by the detected RF input signal

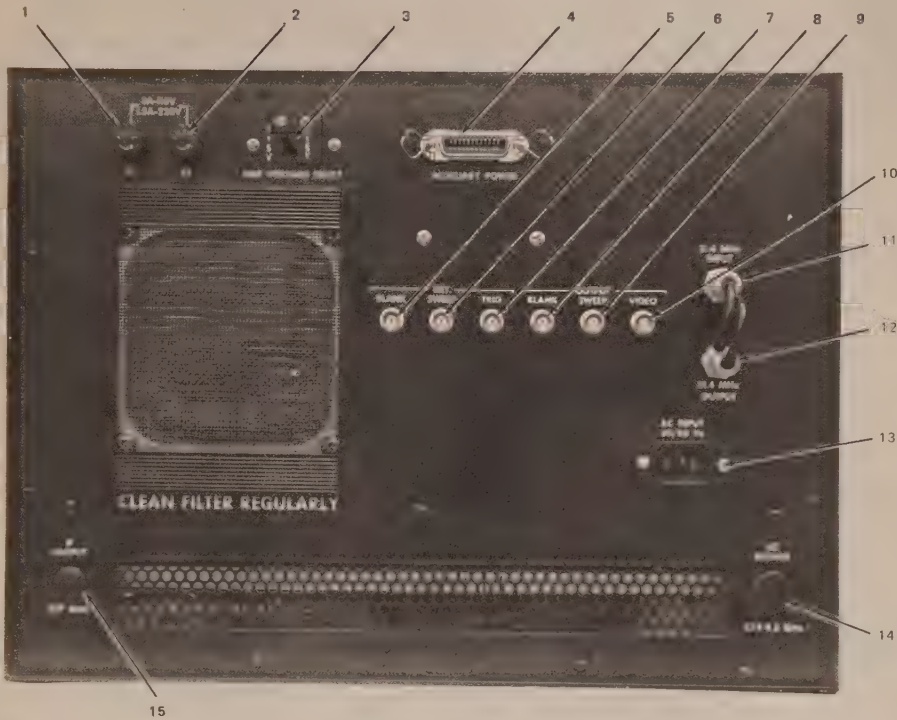
			Theory of Operation
		EXT TRIG:	Scan triggered by an external +2 volt minimum signal
		SINGLE:	Single scan initiated by concentric SINGLE pushbutton switch.
		EXT SWEEP:	Requires external 0 to +6 volts signal for 10 division left-to-right horizontal deflection
		MANUAL:	Allows manual scanning by use of the concentric MANUAL vernier.
19	SINGLE/MANUAL switch		
			Pushbutton concentric with SCAN MODE switch. SINGLE pushbutton indicates single scan. MANUAL vernier allows manual scanning.
20	CONTRAST control		
			Adjusts intensity of the clipped portion of the display.
21	BASELINE control		
			Adjusts baseline clipping level.
22	Display Unit Controls		
			Refer to applicable display manual for a description of the display unit controls which is located in the rear of the Service Manual.
DISPLAY	VERTICAL POSITION control (↓)		
			Screwdriver control for vertical position adjustment.
	HORIZONTAL POSITION control (←→)		
			Screwdriver control for horizontal adjustment.
	OPERATE LEVEL		
			Controls the sensitivity to the writing beam and brightness of the stored display.
	INTENSITY		
			Controls the display brightness in the non-storage mode.
	FOCUS		
			Provides adjustment to give a well defined display.
	ERASE		
			Momentary pushbutton that initiates the erasure of all stored information.
	STORE*		
			A Push Switch that initiates the storage operation.
	PERSISTENCE/SAVE**		
			This switch controls the persistence level. Turning this switch counterclockwise increases the persistence which gives a longer retention to the display. Therefore turning the control clockwise will decrease the time a stored signal is retained. To retain the stored trace pull the switch out and turn it as required to retain the display at a convenient intensity level.

*72711, 12
 **72711 only

Figure 2-3. Front Panel Controls and Indicators
 (Sheet 2 of 2)

Reference No.	Nomenclature and Function
1	FUSE (F1) Main power fuse (3 ampere/115 volt, 1-1/2 ampere/230 volt)
2	FUSE (F2) Main power fuse (3 ampere/115 volt, 1-1/2 ampere/230 volt)
3	LINE VOLTAGE SELECT Two-position switch for 115 or 230 volt use
4	AUXILIARY POWER Used in conjunction with tracking generator or additional display monitor. See wiring diagram for signals and voltages.
5	EXT BLANK External blanking input to blank during retrace (+5 volts required)
6	EXT SWEEP External sweep input (0 to 6 volt ramp positive-going for left-to-right sweep required)
7	EXT TRIG External trigger input to initiate sweep, 1 volt positive required; triggers on positive going transition
8	BLANK OUTPUT Output voltage during retrace (greater than +2 volts)
9	SWEEP OUTPUT Output voltage proportional to horizontal sweep (0 to 6 volt ramp, positive-going for left-to-right sweep)
10	VIDEO OUTPUT Output voltage proportional to vertical deflection 1 volt (typical) = top of screen 0 volt = bottom of screen
11	21.4 MHz INPUT 21.4-MHz input to log amplifier
12	21.4 MHz OUTPUT 21.4-MHz linear output, 0 dBm (typical) = top of screen with -11 dBm input
13	AC INPUT 50/60 Hz Ac line cord input jack

- 14 **LO OUTPUT (003 OPTION)**
See Appendix of Service Manual for detailed description
- 15 **IF OUTPUT (002 OPTION)**
See Appendix of Service Manual for detailed description



NOTE: Items 11 and 12 must be connected by jumper for proper performance.

Figure 2-4. Rear Panel

CHAPTER 3

MAINTENANCE

3-1. INTRODUCTION

This chapter contains instructions for isolating malfunctions to a general functional area or component of the AILTECH 727. These instructions are based on the assumption that the reader is familiar with the operating procedures for the AILTECH 727 and the test equipment required to perform these procedures. The procedures are designed for a technician who is experienced in the operation and maintenance of this or similar equipment.

3-2. GENERAL INFORMATION

This section contains a functional description of some of the basic components of the AILTECH 727 circuitry. The information contained herein covers the operation of junction transistors, field effect transistors (FET), basic logic circuit elements, integrated circuits, and operational amplifiers. In order to better understand the troubleshooting procedures, it is advisable that this basic information be reviewed before proceeding.

3-3. BASIC JUNCTION TRANSISTOR

The basic junction transistor consists essentially of two PN junctions placed back to back. The transistor is a device that acts as a current amplifier. The three connections to the transistor are the emitter, the collector, and the base. The base region is generally very thin. In operation, the transistor is biased to perform its function. Biasing of the NPN type transistor is shown in Figure 3-1. Biasing of the PNP type transistor is shown in Figure 3-2.

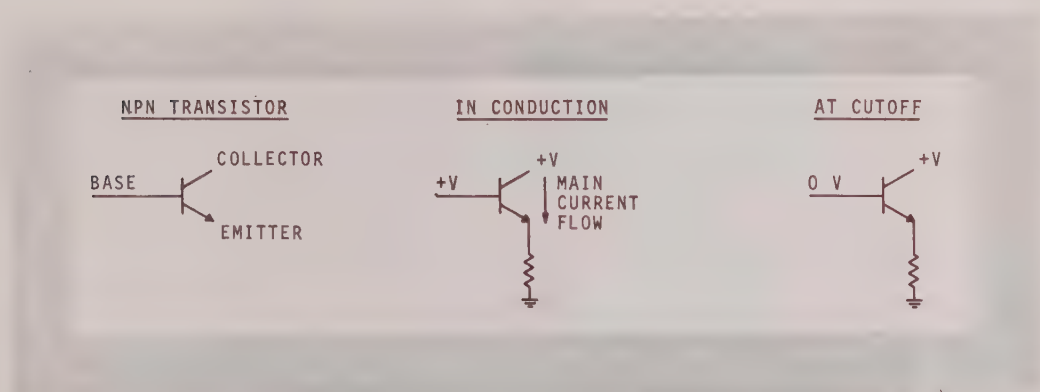


Figure 3-1. NPN Transistor Biasing

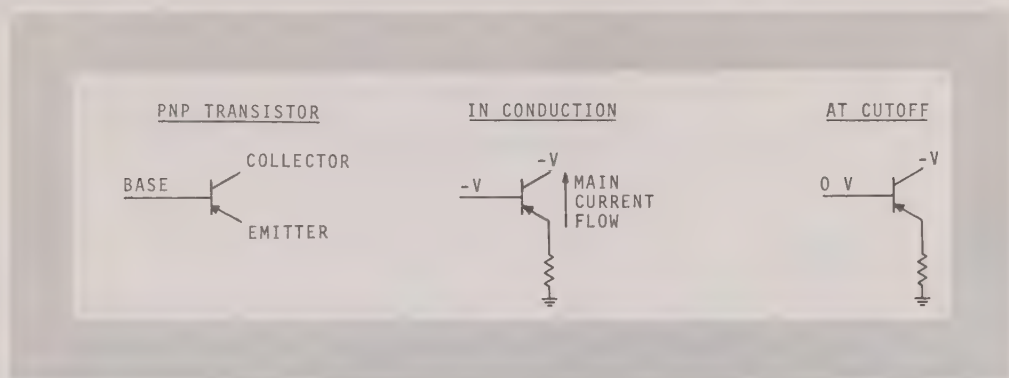


Figure 3-2. PNP Transistor Biasing

The most common cause of transistor failure is internal short circuits or internal open circuits. To check a transistor for shorts or opens, a standard ohmmeter is used. Before checking a transistor with an ohmmeter, be sure to check that the ohmmeter is on the proper scale since most ohmmeters can supply enough current or voltage to damage a transistor. Table 3-1 lists the most commonly available types of ohmmeters and the safe scale settings of each type; these scale settings must be used to avoid damaging the transistor under test.

In addition, the ohmmeter positive and negative probes should be used only as follows:

<u>Transistor Type</u>	<u>Positive Probe</u>	<u>Negative Probe</u>
NPN	Base Base	Emitter Collector
PNP	Collector Emitter	Base Base

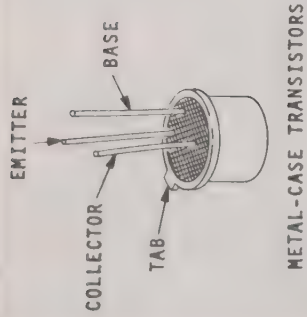
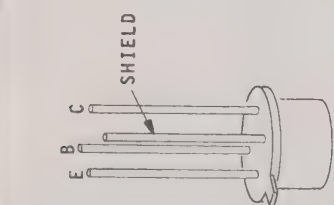
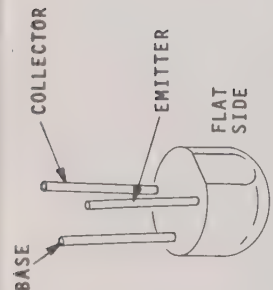
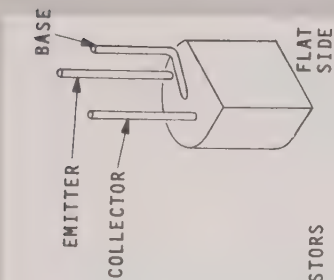
The physical configuration of the different types of transistors used in the AILTECH 707 are shown in Figure 3-3.

3-4. FIELD EFFECT TRANSISTOR

The field effect transistor (FET) is a voltage-sensitive device which has an extremely high input impedance. Field effect transistors have three elements: the source, the drain, the gate (Figure 3-4). The conducting path between the source and the drain is called the channel. By placing a small positive potential on an N-channel drain, electrons will flow from the source to the drain. Therefore, the current flow will be from drain to source. Varying the gate voltage will result in a variation in channel width and resistance. Thus, it is the gate voltage variation that causes a change in the current drain, making the FET a voltage-sensitive device.

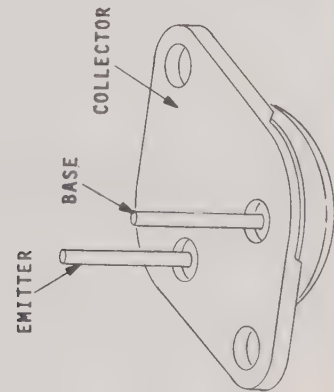
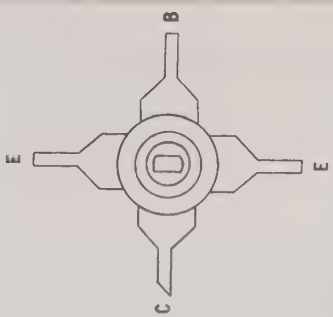
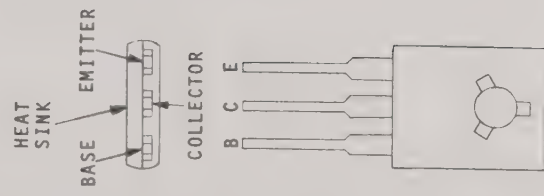
Table 3-1. Characteristics of Common Ohmmeters

Make, Model and Range	Open Circuit Voltage	Short Circuit Current	Polarity
<u>Simpson 260</u>			
R × 1	1.5 V	125 mA	Red (+)
R × 100	1.5 V	1 mA	
R × 10K	7.5 V	60 μA	Black (-)
<u>Simpson 269</u>			
R × 1	1.5 V	74 mA	Red (-)
R × 10	1.5 V	8 mA	
R × 100	1.5 V	8 mA	Black (+)
R × 1K	1.5 V	0.82 mA	
R × 10K	24 V	1.3 mA	
R × 100K	30 V	13 μA	
<u>Triplett 630</u>			
R × 1	1.5 V	320 mA	Red (-)
R × 10	1.5 V	32 mA	
R × 100	1.5 V	3.25 mA	(Varies with serial number)
R × 1K	1.5 V	325 μA	
R × 100K	22.5 V	70 μA	
<u>Triplett 310</u>			
R × 1	1.5 V	7.5 mA	Red (-)
R × 10	1.5 V	750 μA	
R × 100	1.5 V	75 μA	(Varies with serial number)
R × 10K	15 V	75 μA	



PLASTIC-CASE TRANSISTORS

METAL-CASE TRANSISTORS



POWER TRANSISTORS

Figure 3-3. Transistor Types

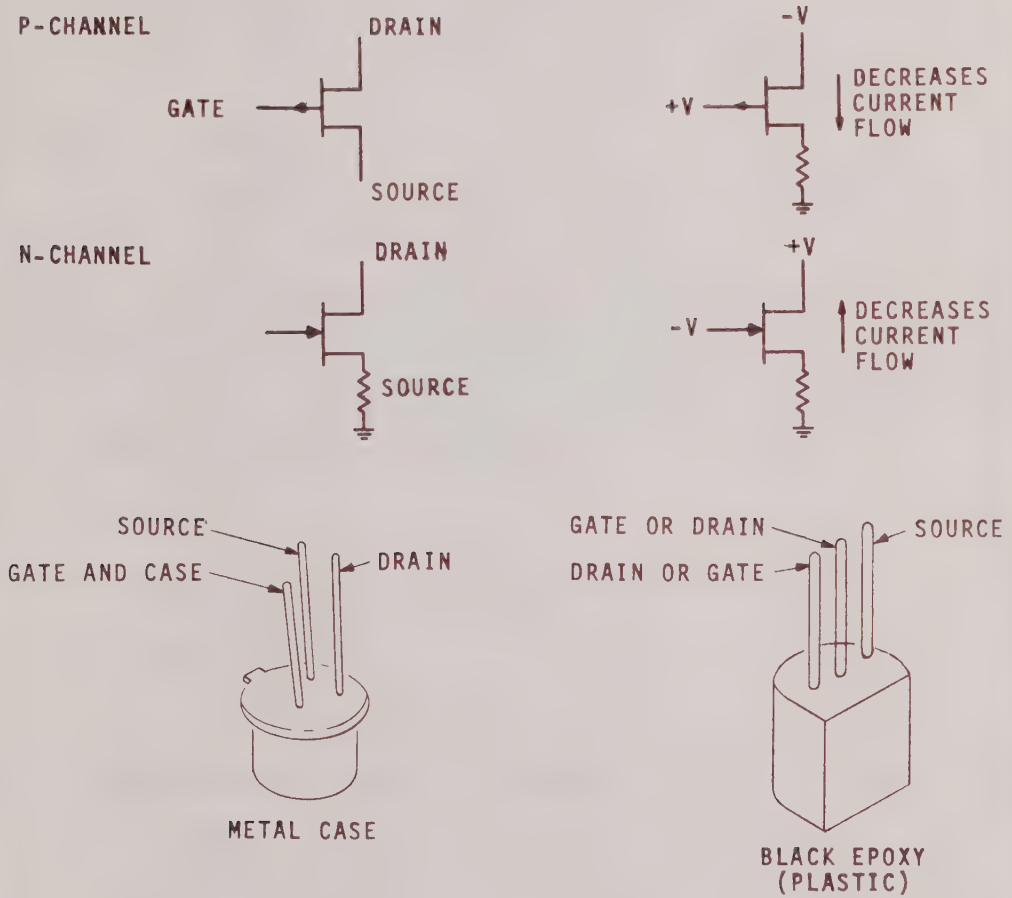
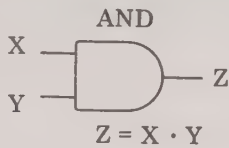


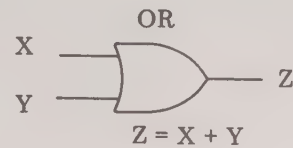
Figure 3-4. FET Biasing

3-5. BASIC LOGIC ELEMENTS

The two most basic forms of logic elements are the AND and OR gates. These are shown below with their respective truth tables.

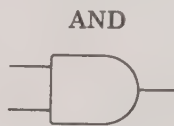


X	Y	Z
H	H	H
H	L	L
L	H	L
L	L	L

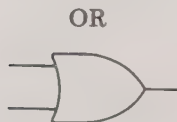
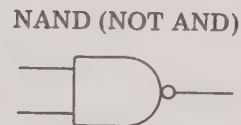


X	Y	Z
H	H	H
H	L	H
L	H	H
L	L	L

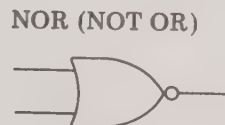
A NAND gate is an AND gate with its output inverted. Similarly, an OR gate becomes a NOR gate when its output is inverted. The same effect can be accomplished by inverting the inputs of each. To illustrate inversion or the input or output levels schematically, a circle is added to the appropriate line. For example:



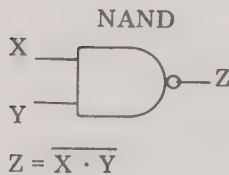
Becomes



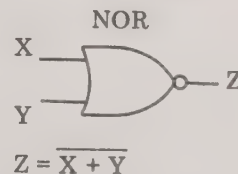
Becomes



Typical NAND and NOR gates are shown below with their respective truth tables.



X	Y	Z
H	H	L
H	L	H
L	H	H
L	L	H



X	Y	Z
H	H	L
H	L	L
L	H	L
L	L	H

An inverter performs a logic level inversion of its input signal. A one-input inverter is shown below with its truth table.



X	Z
H	L
L	H

3-6. INTEGRATED CIRCUITS

Basic logic gates are grouped in various combinations to form integrated circuit chips. Figure 3-5 shows the physical configuration of some typical integrated circuit chips used in the AILTECH 727.

3-7. OPERATIONAL AMPLIFIERS

Operational amplifiers are used to implement several functions. They are used as summers, regulators, buffers, amplifiers, integrators, and offset amplifiers. Figure 3-6 shows some general examples of the use of operational amplifiers.

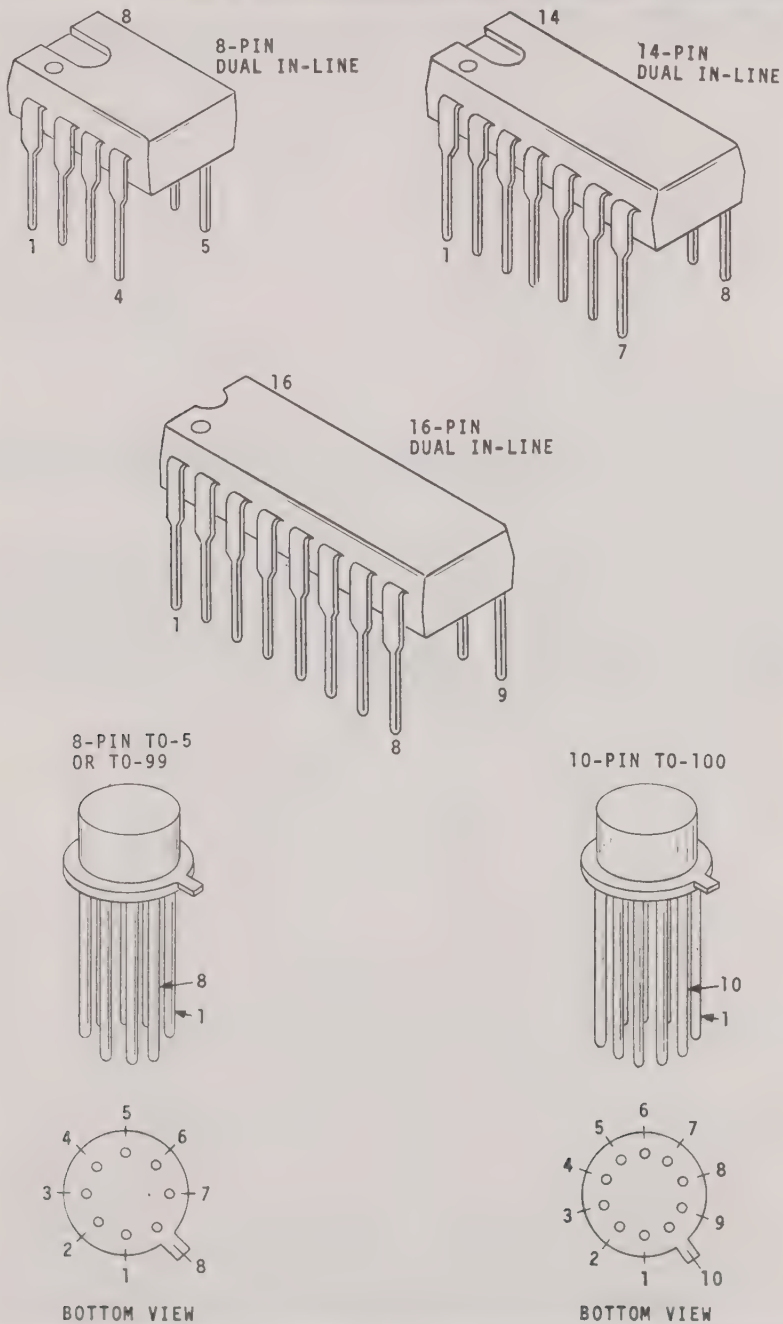
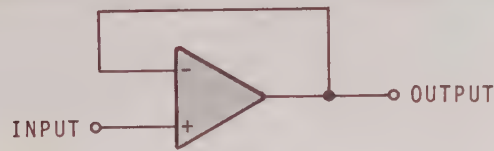
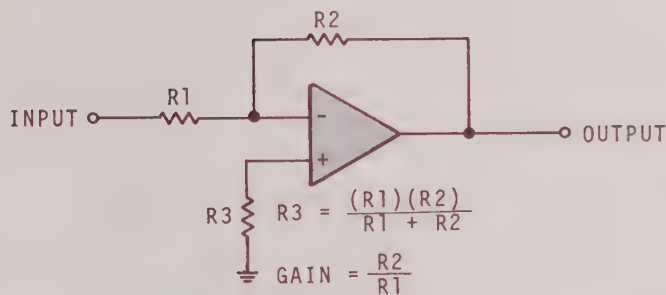


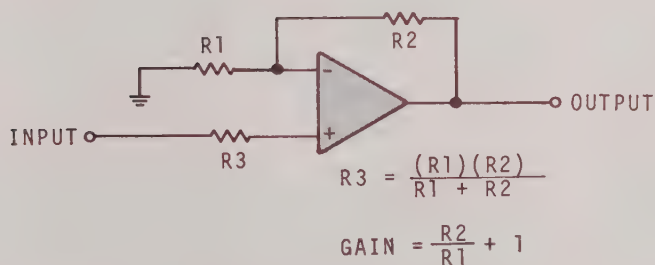
Figure 3-5. Integrated Circuit Chips



UNITY GAIN VOLTAGE FOLLOWER
HIGH INPUT IMPEDANCE
LOW OUTPUT IMPEDANCE



INVERTING AMPLIFIER
LOW OUTPUT IMPEDANCE
R1 IS INPUT IMPEDANCE



NONINVERTING AMPLIFIER
LOW OUTPUT IMPEDANCE
HIGH INPUT IMPEDANCE

Figure 3-6. Typical Applications of Operational Amplifiers

3-8. FAULT ISOLATION PROCEDURES

Fault isolation procedures for the AILTECH 727 consist of a complete checkout of the instrument under normal operating conditions. Standard laboratory test equipment is utilized throughout the procedures. Reference should be made to Chapter 4 of this manual for location of parts and test points, as well as for schematic diagrams of the instrument. Detailed procedures for fault isolation must be performed in the sequence given except where otherwise specified.

3-9. TEST EQUIPMENT REQUIRED

The test equipment required for troubleshooting the AILTECH is listed in Table 3-2. Equivalent equipment may be used unless otherwise specified.

Table 3-2. Test Equipment Required

<u>Equipment</u>	<u>Identification</u>
100-MHz Comb Generator	AILTECH 707-90
Oscilloscope	Tektronix 502*
Signal Generator	Logimetrics 921A
Signal Generator	Logimetrics 750
Signal Generator	Hewlett-Packard 8616A
Power Meter	Boonton 42A
Frequency Meter	Hewlett-Packard 536A
Frequency Meter	Hewlett-Packard 537
Digital Voltmeter	Systron Donner 7004
Oscilloscope	Tektronix 454
Frequency Meter	Microlab/FXR Model Y410A

3-10. PRELIMINARY PROCEDURES

- a. Check that the rear panel LINE VOLTAGE SELECT switch is in the correct position and the correct fuses are in place for the line voltage in use. Connect the AILTECH 727 to 115 or 230 Vac as required.
- b. Set the AILTECH 727 controls and switches as follows unless otherwise indicated in text.

Switch	Setting
RF RANGE	1.8-4.0
FULL RANGE	OFF
RF ATTEN	0
IF ATTEN	10
TUNING	3000 MHz
SCAN MODE	AUTO
SCAN WIDTH	100 MHz
SCAN TIME	3 msec
BANDWIDTH (kHz)	AUTO
BANDWIDTH VIDEO	AUTO
AMPLITUDE RANGE	10
POWER	ON (up position)

3-11. AC AND DISPLAY UNIT CHECKOUT

Perform a checkout of the ac input, the power supplies, and the display unit as described in the flow chart of Figure 3-7 and the accompanying instructions. The numbers shown in the upper left corner of the instruction boxes of the flow chart refer to the accompanying instructions which are similarly numbered. Each instruction explains in detail the operations to be performed for that instruction box.

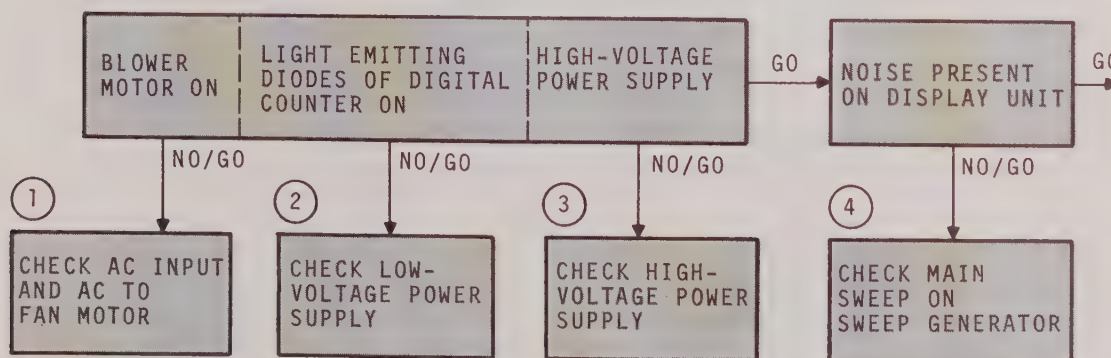


Figure 3-7. Power Supplies and Display Unit Checkout

① AC CHECK

At initial turn on, listen for the sound of the blower motor. If it is not on, check the two fuses on rear panel (Figure 4-23) and the ac connection from the power supply distribution board (Figure 4-21) to the fan motor.

② LOW VOLTAGE CHECK

Check to see if the light emitting diodes of the digital display are on. If not, check the low-voltage power supply (230426) (Figure 4-21) for the appropriate voltages: +24 Vdc, +18.3 Vdc, -18.3 Vdc, and +5 Vdc.

③ HIGH VOLTAGE CHECK

WARNING

The display unit high voltage power supply transformer delivers voltages in excess of 7000 volts. Extreme care should be taken when troubleshooting is being done in this area. Servicing should be performed by experienced personnel. If it is determined that the CRT is faulty, care should be taken in the replacement of this part to avoid implosion. Spent CRT's should be carefully wrapped in soft packing material and cushioned from outside shocks before being boxed and discarded.

④ NO NOISE OR LOW LEVEL NOISE

If noise is not present on the CRT, check that the reference sweepout signal on the J1 sweep generator board (230216) is as shown in Figure 4-16, waveshape  . If

the waveshape is not as shown and there is just a dot in the center of the CRT, +6 V reference is probably at fault. Check that the ± 6 V reference on the J4 preamplifier board (230480) (Figure 4-20) is working properly. The dot may also be caused by defective Q7 and Q8 transistors on the J18 YIG driver board (299400) (Figure 4-29). To check these two transistors, reduce the SCAN WIDTH switch setting to 300 kHz. If the noise is now present, this verifies that Q7 and Q8 are shorted and both should be replaced. If, however, the dot is still present, check the horizontal and vertical deflection on the deflection amplifier. If the deflection amplifier is working properly, recheck the low-voltage power supply for a low voltage.

3-12. RF AND IF SECTION CHECKOUT

- a. Perform an RF sensitivity check using front panel controls.

1. Set front panel controls of the AILTECH 727 as follows:

<u>Switch</u>	<u>Position</u>
SCAN WIDTH	3 MHz
BANDWIDTH VIDEO	500
BANDWIDTH (kHz)	1000
IF ATTEN	10
RF ATTEN	0
RF RANGE	0.001 to 2.0
TUNING	1000 MHz

2. Set the appropriate signal generator to 1000 MHz. Calibrate the signal generator's variable attenuator with the use of a power meter at -10 dBm.

3. Connect the signal generator to the RF INPUT jack of the AILTECH 727. Reduce the signal level of the generator until the signal is 2 dB above the noise. (It may be necessary to vary the IF ATTEN switch several dB in order to make the reading of the measurement easier.)

4. The 1-MHz per division sensitivity for band 1 should be -90 dBm minimum with an IF Bandwidth of 1 MHz.

5. The sensitivity of the other bands can be determined by repeating the preceding steps for the frequencies and bands listed below:

<u>RF RANGE (GHz)</u>	<u>Tuning and Signal Generators</u>	<u>1 MHz (BW) Sensitivity</u>
1.8 to 4.0	3000 MHz	- 80 dBm min
3.3 to 8.3	5800 MHz	- 75 dBm min
5.4 to 12.4	8900 MHz	- 70 dBm min
10-20	15,000 MHz	- 60 dBm min

6. If sensitivity is as specified above, no further RF and IF section checks are necessary. If, however, sensitivity does not meet these requirements, proceed with the following RF and IF section checkout.

- b. Perform a checkout of the RF and IF section as described in the flow chart of Figure 3-8 and the accompanying instructions. The numbers shown at the upper left corner of the instruction boxes of the flow chart refer to the accompanying instructions which are similarly numbered. Each instruction explains in detail the operations to be performed for that instruction box.

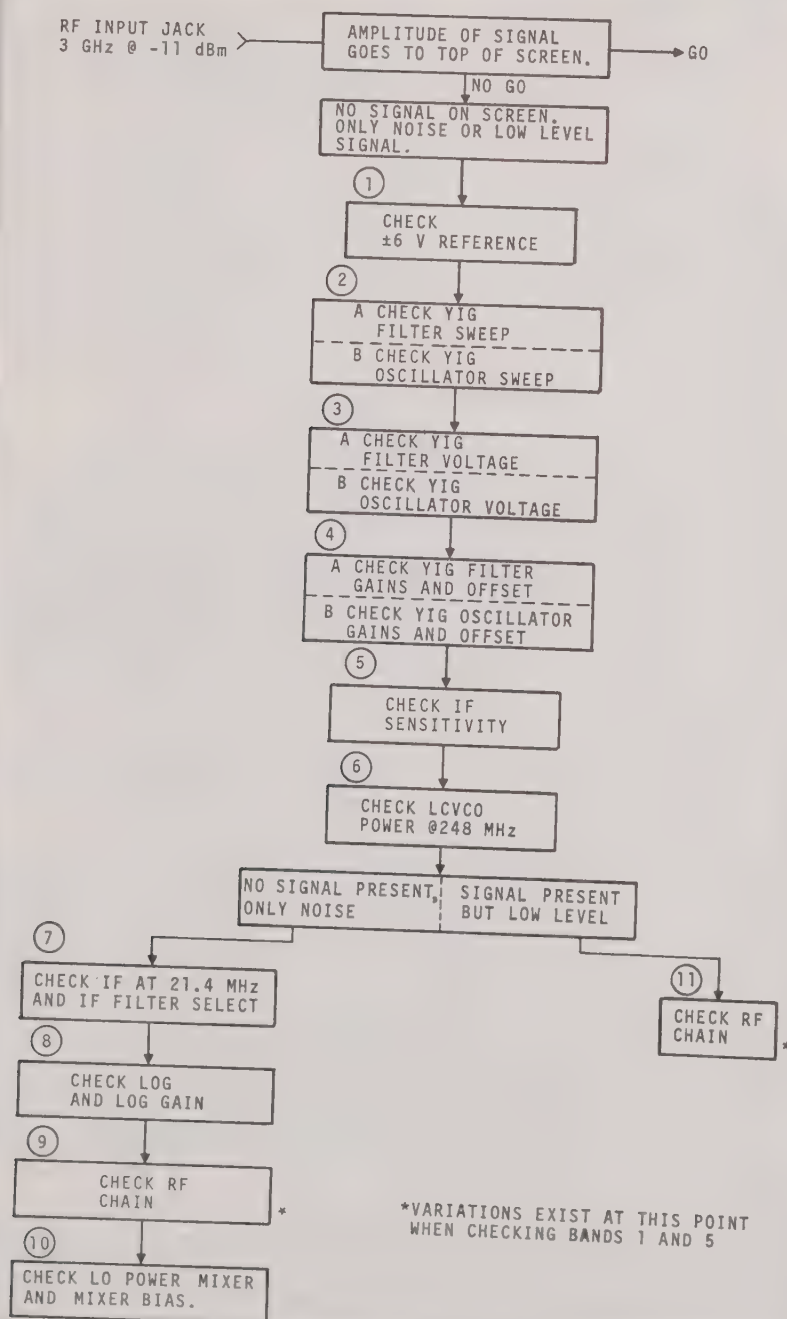


Figure 3-8. RF and IF Section Checkout

① ±6 REFERENCE CHECK

The +6 V reference is located on the J4 preamplifier board (230480) (Figure 4-20). The +6 V reference can be conveniently measured at the cathode of CR6 while the -6 V reference can be measured at the anode of CR7. If necessary, adjust the +6 V reference by adjusting R34 to $+6.000 \pm 0.001$ Vdc. The -6 V reference can be adjusted by varying R31 such that at final setting it reads -6.000 ± 0.001 Vdc.

② YIG FILTER SWEEP CHECK

Check the YIG filter signal at pin 5 of the J18 YIG driver (299400) for waveshape  of Figure 4-29. If it is not present, check for correct filter gain at pin 4 (waveshape  of Figure 4-29). If the input is not correct, check the YIG sweep at pin R of the J1 sweep generator board (230216) for waveshape  of Figure 4-16. (This is where the YIG sweep is generated.)

②B YIG OSCILLATOR SWEEP CHECK

Check the VCO tune signal at pin 15 of the J18 YIG driver (299400) for waveshape  of Figure 4-29. If it is not present, check the VCO gain at pin B for waveshape  of Figure 4-29. If the input is not correct, check the YIG sweep at pin R of the J1 sweep generator board (230216) for waveshape  of Figure 4-16. (This is where the YIG sweep is generated.)

③A YIG FILTER VOLTAGES CHECK

Check the YIG filter (299463) (Figure 4-24) for +24 Vdc on pin 2 and +24 Vdc return on pin 3. This is the heater control voltage. Pin 1 is the plus filter drive and pin 4 is the minus filter drive.

③B YIG OSCILLATOR VOLTAGES CHECK

Check the YIG VCO (230186) (Figure 4-24) for the +18 Vdc on pin 7. In addition, check for the presence of the plus and minus FM tune signals on pins 3 and 4 at 1 MHz/div and VCO drive signal on pins 5 and 6 in 10 MHz/div.

④A YIG FILTER OFFSET AND GAIN ADJUSTMENT CHECK

The YIG FILTER OFFSET and GAIN adjustment potentiometers are located on the RF RANGE switch (299302) (Figure 4-5). See Figure 3-11 for adjustment locations. The band 2 (1.8 - 4.0 GHz) FILTER OFFSET potentiometer is R47. The YIG FILTER GAIN potentiometer is R20. Refer to paragraph 3-33 to 3-37 for the final settings of these potentiometers.

④B YIG VCO OFFSET ADJUSTMENT CHECK

The YIG VCO OFFSET potentiometers are located on the RF RANGE switch (299302) (Figure 4-5). See Figure 3-11 for adjustment locations. The band 2 (1.8 - 4.0 GHz) VCO OFFSET potentiometer is R32. By varying this potentiometer, the frequency of the VCO can be shifted. Refer to paragraph 3-34 for the adjustment procedure and final setting of this potentiometer.

⑤ IF SENSITIVITY CHECK

To check the IF sensitivity, disconnect the 227-MHz band-pass filter and the mixer bias. Inject a 227-MHz at -10 dBm signal into the 227-MHz band-pass filter (299374) (Figure 4-24) see point ①D of the block diagram (Figure 3-14). Adjust the frequency of signal generator for maximum response. The noise level should rise to the top of the screen. Reduce the injected signal until the noise no longer moves when the signal is varied; this should be at approximately -105 dBm when the 1-MHz scan width is selected. Reconnect the 227-MHz band-pass filter and the mixer bias (230500) after completion of this test.

⑥ LCVCO ASSEMBLY CHECK

Check the 248-MHz power out of the LCVCO assembly (230543) (Figure 4-32). The power should be between -5 dBm and 0 dBm at the 248 MHz TEST port.

⑦ IF AT 21.4 MHz CHECK

The 248-MHz and the 227-MHz signals are mixed in the IF assembly (299350) to generate the 21.4-MHz IF. To check the IF, jump the cables that are connected to the PROCESSOR INPUT and PROCESSOR OUTPUT (Figure 4-25). Use a signal generator to inject 227 MHz into the RF INPUT of the IF mixer (230394) and measure the IF sensitivity by varying the RF attenuator of the signal generator. The sensitivity should be approximately -100 dBm. This will isolate the IF problem. With the PROCESSOR INPUT and PROCESSOR OUTPUT cables reconnected to the IF assembly, inject 21.4 MHz into the IF OUTPUT cable (Figure 4-25) of the IF attenuator (299367) and measure the sensitivity. It should be approximately -100 dBm. Reconnect cables.

⑧ IF AND LOG/LOG GAIN CHECK

Verify the operation of the log IF by injecting a 21.4-MHz signal into the 21.4 INPUT connector on the rear panel (Figure 4-23). Measure the sensitivity at this point; it should be approximately -105 dBm. In addition, verify the operation of the log gain circuitry on the J4 preamplifier board (230480) (Figure 4-20). Log output voltage should be within the range of +3.2 to +5.6 Vdc.

⑨ and ⑪ RF CHAIN CHECK

Check the RF chain by signal injection through the chain to fault isolate to any one component using the values found on Figure 3-14.

NOTE

In band 1 (0.001 - 2.0 GHz) the impedance from the RF input to the band 1 mixer with 0 dB on the IF and RF attenuator should be approximately 10 ohms to ground as measured with an ohmmeter. Less than 1 ohm is correct for bands 2 through 5.

The overall gain in band 2 (1.8 - 4.0 GHz) should be approximately 15 ± 7 dB. This gain is measured at 3000 MHz with the AILTECH 727 set as follows:

SCAN TIME	100 μ sec (signal peaked)
RF ATTEN	0 dB
IF ATTEN	0 dB
SCAN WIDTH	< 3 MHz
BANDWIDTH	1000 kHz

In addition, the band 2 VSA should be 16 dB referenced to band 4 (5.4 - 12.4 GHz). With a power meter connected to the rear panel 21.4 OUTPUT jack, inject a signal into the RF INPUT jack with sufficient power such that the power meter reads 0 dBm. At each measurement the response should be peaked by tuning the AILTECH 727. Table 3-3 shows point-to-point gain at 3 GHz. Table 3-4 shows the correct signal levels through the RF chain.

Table 3-3. Point-to-Point Gain at 3 GHz

Figure 3-14
Test Points

(A)	to	(B)	-2.0 ± 0.5
(B)	to	(C)	-10 ± 1.5
(C)	to	(D)	-9 ± 1.0
(D)	to	(D')	-2.5 ± 0.5
(D')	to	(E)	$+12.5 \pm 1.0$
(E)	to	(G)	-12.5 ± 1
(G)	to	(H)	$+37.5 \pm 2$
(A)	to	(I)	15.5 ± 7

Table 3-4. Signal Levels

Figure 3-14
Test Point

(A)	-15.5 dBm $\pm$ 7.0 at 3 GHz
(B)	-16 dBm $\pm$ 7 at 3 GHz
(C)	-27 dBm $\pm$ 5.5 at 3 GHz
(D)	-35 dBm $\pm$ 4.5 at 227 MHz
(D')	-37.5 dBm $\pm$ 4 at 227 MHz
(E)	-25 dBm $\pm$ 3 at 21.4 MHz
(G)	-37.5 dBm $\pm$ 2 at 21.4 MHz
(H)	0 dBm at 21.4 MHz
(I)	0 dBm at 21.4 MHz

If the unit has the correct overall gain, the sensitivities should be correct. Table 3-5 shows the correct sensitivities at each point in the RF chain.

Table 3-5. Typical RF Sensitivities

Figure 3-14
Test Point

Typical Sensitivity

Frequency

(A)	-84 dBm	3 GHz
(B)	-84 dBm	3 GHz
(C)	-99 dBm	3 GHz
(D)	-106 dBm	227 MHz
(D')	108.5 dBm	227 MHz
(E)	-98 dBm	227 MHz
(E')	-106 dBm	21.4 MHz
(G)	106 dBm	21.4 MHz
(I)	-100 dBm	21.4 MHz

The oscillator power levels are given on the block diagram (Figure 3-10).

10 LO POWER AND MIXER BIAS

Check that there is sufficient LO power and that the mixer bias is getting sufficient voltage. Refer to the system block diagram (Figure 3-14) for appropriate levels.

NOTE

When checking band 1, follow a similar procedure; however, note that in band 1 there is additional circuitry and no sweep present on the YIG filter.

11 RF CHAIN (See 9 above)

3-13. PHASE-LOCK LOOP CHECKOUT

Perform a checkout of the phase-lock loop as described in the flow chart of Figure 3-9 and the accompanying instructions. The numbers shown at the upper left corner of the instruction boxes of the flow chart refer to the accompanying instructions which are similarly numbered. Each instruction explains in detail the operations to be performed for that instruction box.

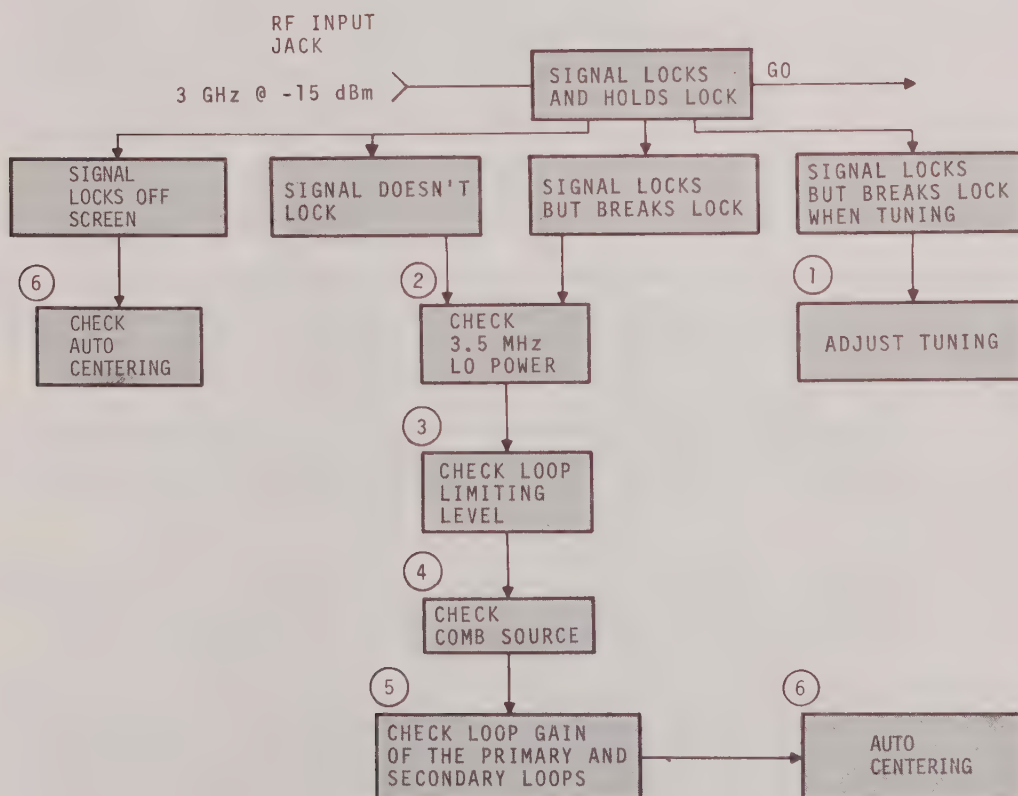


Figure 3-9. Phase-Lock Loop Checkout

① SIGNAL BREAKS LOCK ONLY WHEN TUNING

If the signal breaks lock only when tuning, the problem may be that the coarse tuning potentiometer is moving with the fine tuning potentiometer. This can be corrected by verifying that the proper clutch is engaging and the distance between the clutch plates is correct. The distance between the plates can be set by loosening the plate and adjusting the distance for 0.010 inch using a "shim". The tuner assembly (299137) (Figure 4-14) is located directly below the digital display. R1 is the coarse tuning potentiometer and R2 is the fine tuning potentiometer. In scan widths of 700 MHz per division to 1 MHz per division, the coarse tuning potentiometer is activated. In scan widths of 300 kHz or less, the fine tuning potentiometer is activated.

② 3.5-MHz LO POWER CHECK

Check to see if the oscillator is operating properly by checking the power output and the frequency of the oscillator. The frequency should be 3.5 MHz at approximately +7 dBm.

③ LOOP LIMITING LEVEL CHECK

With the SCAN WIDTH switch set to 300 kHz, inject a 3.5 MHz signal into the SIGNAL IN port of the loop assembly (299375) (Figure 4-39). Using another spectrum analyzer and a scope probe on the IF test point (Figure 4-41), beat the external 3.5 MHz signal against the internal 3.5 MHz signal to center the signal generator. Remove the internal 3.5 MHz signal by removing the cable from the 3.5 MHz oscillator to the 3.5 MHz input to the loop. Measure the loop limiting level by finding the 1-dB compression point. This should be approximately -80 dBm. After this test, reconnect the 3.5 MHz oscillator and the SIGNAL IN cable.

④ COMB SOURCE CHECK

Set the SCAN WIDTH switch to 200 MHz and the RF RANGE switch to band 2 with the frequency set at 3000 MHz. Connect the comb output (from the output of attenuator 230195-3 which is mounted on comb generator 230471-2, Figure 4-24) to the AILTECH 727 RF INPUT jack. Using a clip lead, connect the -18V on the LCVCO assembly (230543) (Figure 4-32) to the -18 V on the comb source. Check the waveform for linearity and ensure that no comb lines are lower than the 70-dB graticule line (RF attenuator 10 dB, IF attenuator 0 dB). After checking for the above, reconnect the cables that were removed and remove the clip lead from the -18 V on the LCVCO assembly and the comb source.

⑤ LOOP GAIN CHECK

With the 3.5 MHz oscillator and limiting IF amplifier operating properly, connect a Tektronix 502 oscilloscope using the differential dc input across the 10 ohms sampling resistor R60 located on the J18 YIG driver board (299400) (Figure 4-33). Set R36 on the J18 YIG driver board fully counterclockwise. Set R32 on the J18 YIG driver board fully counterclockwise. Put a 3-GHz S-band signal into the RF INPUT jack of the AILTECH 727. Move it to the center of the screen at the 1 MHz/div dispersion and set the SCAN WIDTH switch to 300 kHz (the phase lock position). It should now be possible to adjust

the SIGNAL CENTER control to skip the displayed signal from line to line on either side of center without depressing the SIGNAL CENTER control. At this point, it should be possible to move the displayed signal only when the SIGNAL CENTER control is depressed; the displayed signal should not move when the SIGNAL CENTER control is undepressed. See paragraph 3-46 for alignment if the unit is not operating properly.

6 AUTO CENTERING

The auto centering board is operating properly when the signal jumps to the center of screen ± 1.5 div when the scan width switch is set to 300 kHz or less. If this does not occur check alignment per paragraph 3-48.

3-14. ADDITIONAL CHECKS

a. Check the full range operation as follows. With the FULL RANGE switch set to ON, verify the operation of the full range marker. If it is not present, or a large dc offset is present, check Z1, Z2, and Z3 and the associated circuitry on the J1 sweep generator board (230216) (Figure 4-16).

b. If the unit is not working properly in the 1 and 3 MHz positions of the SCAN WIDTH switch, check Z1 and S3. Check the J18 YIG driver board (299400) (Figure 4-29) for the appropriate waveforms at test points   and .

3-15. SYSTEM PERFORMANCE CHECK

This section contains calibration and adjustment procedures for the AILTECH 727 Spectrum Analyzer. The procedures presented in this section will aid the user in determining if the instrument is operating properly and in aligning the instrument for optimal performance.

The procedures should be scheduled on a periodic basis. If a system malfunction is discovered while performing these procedures, refer to paragraph 3-8 for fault isolation procedures.

NOTE

The user should be familiar with the operating procedures presented in the Operating Manual before attempting to calibrate or adjust the instrument.

The following sequence of checks on the AILTECH 727 Spectrum Analyzer are designed to verify the performance of the instrument. All checks are performed using the front panel operating controls.

3-16. INITIAL TURN-ON

Set the POWER switch to the on position and note that the following occurs: (1) the blower motor starts with an audible sound; (2) the MHz digital readout illuminates indicating a number denoting the frequency at the center of the screen. After a short warmup (2 to 10 seconds), the cathode ray tube will illuminate; noise, and possibly signals, should be present.

3-17. INITIAL CONTROL SETTINGS

Set the switches and controls as follows to obtain normal presentation:

SCAN MODE	AUTO (sweep is self-synchronous)
SCAN WIDTH	200 MHz
SCAN WIDTH vernier	CAL (fully clockwise)
SCAN TIME	3 msec
SCAN TIME vernier	CAL (fully clockwise)
BANDWIDTH:	
(kHz)	AUTO (The 1-MHz IF filter for the selected scan width and scan time combination is energized.)
VIDEO	AUTO (The AUTO settings of the VIDEO control links it with the IF filter selection.)
AMPLITUDE RANGE	10 LOG (dB/DIV)
RF ATTEN	10 (The setting of the RF ATTEN switch limits the amount of power incident into the AILTECH 727.)
IF ATTEN	10 (The setting of the IF ATTEN switch normalizes the overall gain of the instrument.)
RF RANGE	0.001 - 2.0
FULL RANGE	OFF
SIGNAL CENTER	Indexing line pointing straight up (centered). (The SIGNAL CENTER control performs very specific functions and is not intended to be used only as a fine tuning control.)

3-18. DISPLAY UNIT ALIGNMENT

To properly align the trace on the screen the HOR POS control and the VERT POS control on the front panel should be adjusted in the following manner:

- a. Allow one-half hour for warmup and set the IF ATTEN switch to 100 and the BANDWIDTH switch to 1 kHz.
- b. Adjust the horizontal control so that the sweep starts at the left edge of the graticule.
- c. Adjust the vertical control to position the trace 1/5 of a division below the 100 dB line. There are two small marks on the graticule which indicate this position which is the 102 dB point.
- d. Set the IF ATTEN switch to 10 and the BANDWIDTH switch to AUTO. The noise presentation on the screen will return to approximately the 70 dB line.

3-19. PERFORMANCE CHECK

To acquaint the operators with the proper action of the instrument, the following performance check is explained in terms of what happens when a check is performed on an instrument which is operating normally.

3-20. Video

As the IF ATTEN switch is varied from the 0 position down through its positions, the baseline noise can be seen to vary up to 30 dB. This is a normal occurrence and is a result of inserting attenuation into the IF chain. The source of the displayed noise is the first amplifier with the least attenuation, and this source moves through the amplifier chain until it finally occurs at the log IF with maximum attenuation. The expansion of the baseline on the AMPLITUDE RANGE switch from 10 dB/DIV to 2 dB/DIV is always around the low portion of the display, that is the 100 dB line. If the noise level is above the 100 dB line when an expansion is selected, the noise will rise up to the middle, or even the top of the display. If enough attenuation has been inserted in the IF chain to drop the noise level to the 100 dB line, the noise level will remain there when the expansion is selected. If a small scale signal is selected in the 2 dB/DIV section with the signal at the top of the screen and the LIN (linear) display selected, the signal will be approximately the same amplitude as the 2 dB display and the baseline will be the same.

3-21. Tuning

The TUNING control has several functions. It is a concentric knob with a fine and coarse control mechanically linked together with an approximate 6:1 reduction, thereby achieving good control of tuning at all times. The control actually drives one of two potentiometers located behind the front panel, and they, in turn, control the entire system. The automatic switchover point is set by the SCAN WIDTH switch when it is switched from 1 MHz to 300 kHz. Thus, one of the potentiometers controls the analyzer for its wide dispersion capability, and the other for its narrow dispersion capability. Rotating the control determines the frequency at the center of the screen, and on the display tube the entire spectrum will move from right to left when this is done. The control also determines the frequency on the digital readout which corresponds to the frequency at the center of the screen.

With the settings of the controls as described, there should be a presentation on the screen of a noise baseline approximately 1 division high and centered on the 70 dB line, plus or minus a division. The noise baseline should extend horizontally more than 10 divisions and its position on the screen is controlled by the TUNING control. Rotating the TUNING control until the frequency readout reads 1000 MHz should position the baseline such that it occupies a little more than the full screen. The starting point of the baseline should be on the very edge of the etched graticule, whereas the ending point extends a little beyond the right edge. Possibly visible on the left edge of the presentation at the 0 MHz point is a large signal referred to as "zero beat." If not visible, the analyzer may be tuned to bring it on to the screen, and then tuned to bring it to the center of the screen. By turning the SCAN WIDTH switch step by step down to 10 MHz, while bringing the signal to the center of the screen, it is possible to view it in better detail. As the SCAN WIDTH switch is reduced, the signal should remain at the center of the screen within a division, so that it will be easy to keep it in view. The signal, which is actually the local oscillator feedthrough in the first mixer, is exactly at 0 MHz reference for the analyzer. This is so because the local oscillator is now tuned to the center of the first IF frequency, and the frequency of the signal on the screen is simply the difference between this local oscillator and the IF.

3-22. Digital Frequency Readout

The frequency readout should be reading approximately 0 MHz. When the analyzer is tuned below 0, the counter will read very high numbers, starting up in the 99-GHz region, and this is normal.

Because YIG devices are utilized in the analyzer, there is a hysteresis effect noticeable on the screen when checking for frequency accuracy. This effect is simply caused by tuning a magnetic device either from plus to minus, or minus to plus, and results in a natural offset of the device. On the analyzer, hysteresis is noticed by a frequency inaccuracy, of as much as 10 MHz in fundamental mixing modes (bands 1 and 2). To eliminate this inaccuracy, it is required to sweep the YIG devices from a single direction and with a relatively fast speed. This can be done by simply rotating the SCAN WIDTH switch from the present 10 MHz up to approximately 200 MHz, and then back down to the 10 MHz position. When this is done, a resulting small shift of the signal will probably occur. This operation is popularly referred to as degaussing, and centers the frequency readout and the signal on the screen. It should be repeated every time an accurate frequency readout is desired if the TUNING control has been changed. The "zero beat" indication on the screen should be between 45 and 70 dB above the noise level where the IF ATTEN switch is set to 20 dB. If less signal is present it could indicate that the local oscillator signal is weak, thereby losing some sensitivity for other signals. If much more signal is present it could indicate damage to the first mixer, thereby decreasing the local oscillator to IF isolation characteristics.

3-23. Scan Width Control

Changing the SCAN WIDTH switch from the 10 MHz position to the 3 MHz position causes two effects (when the SCAN TIME switch is set at 3-msec). One, if the IF bandwidth is automatically switched from 1000 kHz to 100 kHz as can be confirmed by rotating the BAND-WIDTH switch to these positions. The second effect is an apparent capacitor charge action, in that the signal that had been on the center of the screen will jump a certain amount and then return toward center. At the 3 MHz position, a capacitor is connected to the main oscillator to increase stability for more detailed analysis. As the SCAN WIDTH switch is switched from 3 MHz band to 10 MHz and then down to 3 MHz, it is noticed that the charge action of the capacitor is much decreased since the initial charge has been erased.

3-24. Auto Centering - Auto Phase Lock

The 727 Series Spectrum Analyzers are supplied with an automatic centering and automatic phase locking system. The auto centering auto phase lock consists of an 8 Hz search oscillator which is located in the Loop Assembly (299375) and an Auto Centering PC board (299378) which is mounted to the underside of the Digital Display board (299468). The auto centering board takes the phase lock loop error voltage and processes it through an A/D converter and then through a D/A converter which samples and holds a digital word, adjusts for band gain variations and sums this voltage with the sweep that feeds the LCVCO (230543), which is located on the Sweep Generator Board (230216). It is this offset on the LCVCO sweep input which causes the phase locked signal to center itself on the display. This in turn cancels out any offset that may have been introduced by the main oscillator while trying to acquire one of the reference comb lines.

3-25. Phase-Lock Loop

When the SCAN WIDTH switch is switched from 1 MHz to 300 kHz, a phase-lock loop system is automatically activated to stabilize the main local oscillator in the analyzer. This oscillator, operating in S-band, is referenced to a crystal controlled comb source which permits a stabilized lock every MHz, when the oscillator is operated in its fundamental mode — that is, when the analyzer is displaying between 0 and 4 GHz. When the analyzer is operating in second, third or fifth harmonic, the lock possibilities occur at every 2 MHz, 3 MHz or 5 MHz. When the actual switch activation is accomplished, the signal on the screen will jump to a lock point, which could occur anywhere on the screen. If the phase lock acquisition is not stable, the signal will appear to have some jitter, or will have sidebands caused by the loop seeking a stable lock. This can be confirmed or overridden by rotating the SIGNAL CENTER control a small amount. If the phase lock is strong, the signal on the screen will not move with this rotation of the control. If the signal does move, it should jump to a stable lock position and then remain as the control is turned a small amount further. Depressing the SIGNAL CENTER control deactivates part of the phase lock system and permits the oscillator to be moved to adjacent comb lines of the stabilization circuit. These positions should be 1 MHz either to the right or the left of the signal, and the signal should actually jump to the spot. If it is possible to walk the signal between two stable points, phase lock adjustment might be required. It is possible to have a stabilized presentation at other than 1 MHz combinations, and these are caused by harmonics in one of the loop mixers. These are stable positions but do not have the firm stability of the main lock. Selecting the most stable position, or the one closest to the center of the screen, the signal can be moved to the center by rotating the TUNING control. It is now noticed that the TUNING control sensitivity has changed drastically as the second potentiometer has been energized. This change in resolution permits the tremendous expansion capability of the analyzer from 700 MHz per division down to 1 kHz per division. Since the digital readout is connected to the main tuning control, and the SIGNAL CENTER control, further tuning in the narrow dispersions will not affect the frequency display. The frequency that is displayed is the frequency of the signal that was in the center of the screen when phase lock was activated. An automatic recentering function is included in the analyzer to maintain the fine tuning potentiometer in the middle of its operating range.

3-26. Crystal Filter Response

With the SCAN WIDTH switch set to 300 kHz and the signal centered on the screen, it may be noticed that the filter shape is not the typical smooth curve, but may have an apparent spurious response usually on the left side of the filter shape. This is normal and is characteristic of a very wide crystal filter. The filter provides excellent selectivity, as is noticed by its better than 5:1 shape factor from 60 to 3 dB. The AILTECH 727 Spectrum Analyzer uses Tchebycheff type filters. These filters are used instead of the Gaussian type filter because of the poor shape factors in the Gaussian type filters. The apparent spurious response or ringing may be apparent approximately 60 dB down from the signal and could be eliminated by changing the SCAN TIME switch to a slower sweep.

With the signal centered on the screen and the SCAN TIME switch set at 3 msec, switching to 100 kHz again changes the filter bandwidth and selects the 10 kHz bandwidth. Further switching down to 10 kHz causes the final bandwidth switch to occur down to 1 kHz. It might be necessary to recenter the signal as the scan width is decreased since the signal was probably not exactly in the center at the wider dispersions. When the narrowest dispersion has been selected and the signal centered, the signal will remain in the center as the scan width is increased.

With the SCAN WIDTH switch set at 10 kHz and the IF bandwidth automatically selected as 1 kHz (AUTO position), further ringing will be noticed on the display. This ringing is characterized by extra responses on the right side of the signal and is normal. It is due to the fact that we are now scanning 100 kHz in frequency with a 1 kHz filter every 30 milliseconds and are not dwelling long enough in the filter bandwidth to permit a normal charge and discharge action to occur. To eliminate the ringing, the scan time can be slowed down to 10 ms per division or the 10 kHz IF filter can be selected. But it should be noticed that when this filter is changed to 10 kHz, a large amount of resolution is lost. The auto select function of the IF bandwidth attempts to select the filter with the best resolution capability without losing the amplitude response of the signal. The filters used in the AILECH 727 Spectrum Analyzer have the characteristic such that they ring before losing amplitude response, thus warning the operator that he has just started to scan too fast. Scanning wider frequencies with the same bandwidth will result in the amplitude loss.

3-27. Amplitude Range

Resetting the SCAN WIDTH switch to 1 kHz, it is noticed that the noise level is up to almost the 50 dB line. At this point it is possible to increase IF attenuation until the peak of the signal is at the 50 dB line and then change the AMPLITUDE RANGE switch to the 5 position, presenting a 50-dB display on the screen only 10 kHz wide. At this point the residual FM of the signal on the screen should be less than 1/5 of one division, or 200 Hz. By selecting the LINE position on the SCAN MODE switch, it is possible to synchronize the sweep to 60 Hz line frequency and remove that component from the residual FM of the displayed signal.

As pointed out previously, the signal on the screen is exactly the zero frequency marker for the analyzer, and if there were other signals present at very low frequencies, they would be visible to the right of the "zero beat." Typically, signals are displayed at less than 50 kHz in frequency to full amplitude, providing the vast range of 50 kHz to 20 GHz in one unit. The signals to the left of zero frequency are spurious signals and should not be analyzed further. This region is an undefined region for the Spectrum Analyzer.

Increasing the IF ATTEN until the signal goes to the 60 dB graticule with 5 dB per division, and switching the AMPLITUDE RANGE switch to 2 dB should once again give a full screen presentation of 20 dB. Switching the control to LIN should give nearly the same presentation, since the linear display is approximately 20 dB, but in this mode 10 dB of IF attenuation should drop the signal approximately 2/3 amplitude. When varying the AMPLITUDE RANGE switch through all of its positions, the average noise of the baseline should stay steady when the narrowest IF bandwidth is being used.

3-28. Time Domain

Returning the SCAN WIDTH switch to 10 MHz and turning the SCAN TIME switch to the position marked 1000 μ sec (TIME DOMAIN) (1 msec per division), a time domain presentation should be visible on the screen. Since the signal being displayed is a CW signal, only the characteristic of the amplitude response of the IF filters will be viewed, and when the TUNING control is varied the amplitude will go up and then down the filter shape. When the BANDWIDTH switch is in its AUTO position the 1 MHz bandwidth is selected when the time domain is activated. If a different bandwidth is desired, it may be manually selected. If amplitude modulation had been present it would be possible to view square waves or pulses, and changing the SCAN MODE switch to VIDEO would synchronize the display on the screen. The triggering level is fixed and thus the amplitude of the signal must be varied to control the presentation.

3-29. General Operation

Returning back to 3 msec on the SCAN TIME switch, setting SCAN WIDTH switch to 200 MHz, and tuning the frequency readout to 1000 MHz we can again see the full zero to 2 GHz presentation. Switching the RF RANGE switch to the 1.8 - 4.0 position (band 2) the unit now displays all of S-band. The frequency readout will be reading approximately 3000 MHz since the center of the TUNING control corresponds to the center of the selected RF range and has the same rate of tuning per MHz in all frequency bands. The vertical level of the baseline for the second band will decrease approximately 5 dB from that of the first band, and indicates the improved sensitivity achievable in this band. By tuning the analyzer to all the frequencies, while remaining in band 2, it should be noticed that signals below 1.5 GHz are viewable before the trace is blanked. This is normal and very useful. The trace is blanked both above and below the frequency ranges selected on the RF RANGE switch to prevent false interpretation of the noise level as being lack of signal. At these points the local oscillator has either lost power or stopped oscillating and thus the analyzer could not display proper signals. The blanking may be overridden by an internal control if the user so desires to permit the fullest operation, although this could potentially cause some readout discrepancies.

Returning the digital readout to 3000 MHz and selecting band 3 (3.3 - 8.3 position on the RF RANGE switch), the baseline should shift approximately 8 dB upward indicating the loss in sensitivity due to second harmonic mixing. The baseline shifting is caused by gain compensation in the analyzer to provide amplitude calibration over the whole frequency range. In this band the SCAN WIDTH switch should be set at 500 MHz to display the whole frequency range. The center of the frequency will be 5800 MHz. Switching of the RF RANGE switch to band 4 (5.4 - 12.4 position) and the SCAN WIDTH switch to the 700 MHz position selects this whole band frequency with the center frequency at 8900 MHz. The baseline again shifts approximately 8 dB and should now be at about the 60 dB line.

3-30. Blanking and Full Range Select

Switching the RF RANGE switch down to band 2 (1.8 - 4.0 position), which had been viewed earlier, should now greatly decrease the horizontal display on the screen since the SCAN WIDTH switch is in the 700 MHz position. The regions outside of the baseline have been blanked since the oscillator cannot perform over this great area. Changing the SCAN WIDTH switch to 200 MHz restores the full sweep presentation. At this point if the FULL RANGE switch concentric to the RF RANGE switch is turned to the ON position, the same 2 to 4 GHz presentation will occur, but with negative marker at the center of the screen. This marker indicates the location of the TUNING control and will follow it as it is changed. The digital readout also indicates the frequency of the marker and permits signals to be identified anywhere within the band. By rotating the FULL RANGE switch to the OFF position, the area around the tuning marker will be expanded to the width selected at the SCAN WIDTH switch. This function is not a truly precise one and the center frequency will be within 30 MHz of that desired.

3-31. Refer to DISPLAY Section of the manual for information on the Display Unit.

3-32. PERIODIC MAINTENANCE

This section contains system checks and alignments to be performed every six months or 1000 hours of use, whichever occurs first, or whenever a major repair or replacement has been performed.

3-33. POWER SUPPLY AND REGULATOR ADJUSTMENT

a. Using a digital voltmeter, check the output voltages of power supply (230426). These voltages should be +18.3, -18.3, +24, and +5 Vdc and are adjustable by their respective pots on the power supply.

b. Connect a digital voltmeter between the anode of CR7 on the preamplifier J4 board (230480) and chassis ground. Adjust R31 on preamplifier board (230480) (Figure 3-11) for a -6 ± 0.005 Vdc reading.

c. Connect a digital voltmeter between the cathode of CR6 on the preamplifier J4 board (230480) and chassis ground. Adjust R34 on the preamplifier J4 board (230480) (Figure 3-11) for a $+6 \pm 0.005$ Vdc reading.

3-34. BAND 1 ALIGNMENT

a. Connect an AILTECH 707-90 Comb Generator or equivalent to the RF INPUT jack of the AILTECH 727.

b. Set the front panel switches and controls to the following positions:

RF RANGE	0.001 - 2.0
RF ATTEN	20
IF ATTEN	10
SCAN WIDTH	200 MHz
BANDWIDTH	
(kHz)	AUTO
VIDEO	AUTO
AMPLITUDE RANGE	10 LOG (dB/DIV)
SCAN MODE	AUTO
BASELINE (outer knob)	Maximum counterclockwise
CONTRAST (inner knob)	Maximum counterclockwise
FULL RANGE (RF RANGE center knob)	OFF
SIGNAL CENTER	Centered
TUNING	Center (digital readout should read 1000 MHz)

c. Twenty comb lines should appear on screen. If not, adjust R50 (Figure 3-11) (band 1 filter offset) on YIG offset board (part of RF RANGE switch 299302) until 20 comb lines appear. Two settings are sometimes possible: the most clockwise setting is correct.

d. Adjust horizontal control on front panel until trace begins on first graticule line (overlap on right side is normal).

e. Set SCAN WIDTH switch to 100 MHz. Adjust R24 (display gain) on sweep generator J1 board (230216) (Figure 3-12) so that each 100-MHz comb line falls on a graticule line. (Some adjustment of TUNING control will be necessary to cause first comb line to fall on first graticule line.)

f. Disconnect AILTECH 707-90 Comb Generator. Adjust TUNING control to approximately 0 MHz until band 1 zero beat frequency signal (refer to paragraph 3-21) is in center of screen. Set SCAN WIDTH switch to 10 MHz and recenter. Set SCAN WIDTH switch to 200 MHz; zero beat should stay in center of screen. If not, adjust R22 (level shift adjust) on sweep generator J1 board (230216) (Figure 3-12).

NOTE

Adjust R22 only when the SCAN WIDTH switch is in the 200 MHz position.

Turn TUNING control to center zero beat when at 10 MHz per division. Repeat procedure until signal remains centered when SCAN WIDTH switch is rotated.

g. Adjust R18 (balance) on preamplifier J4 board (230480) (Figure 3-10) until there is no baseline movement when the AMPLITUDE RANGE switch is rotated between the 2, 5, and 10 positions with the IF ATTEN switch set to 100 dB. Return the IF ATTEN switch to 10 dB after alignment.

h. Adjust R32 (log gain) on preamplifier J4 board (230480) (Figure 3-10) until it is approximately five turns from maximum counterclockwise position. This should position R32 such that the display is properly calibrated, that is, the display varies linearly with the setting of the IF ATTEN switch. It may be necessary to vary R32 slightly clockwise to achieve this. Some interaction with the VERT control will be noted. Repeat paragraph 3-18 before continuing.

i. Turn TUNING control to center of band (1000 MHz) and connect the comb source (AILTECH 707-90 Comb Generator). Ground test point on digital display (299468) with a clip lead (Figure 3-13). The digital readout should indicate 1000 MHz. If not, adjust R69 (band 1 slope) (Figure 3-11) on digital display gain board (231028) (part of RF RANGE switch 299302) for the proper reading.

j. Locate 1000-MHz comb line by counting 10 lines up from the zero beat line. (Zero beat line does not change amplitude when RF ATTEN switch is rotated.) The 1000-MHz line should fall in center of screen. If not, adjust R35 (band 1 VCO offset) (Figure 3-11) on YIG offset board (230339) (part of RF RANGE switch 299302). Adjust R50 (Figure 3-11) on YIG offset board (230339) (part of RF RANGE switch 299302) for maximum amplitude.

k. Remove clip lead from test point on J3 board and set zero beat signal to center of screen at 10 MHz per division. Adjust R58 (band 1 gain) (Figure 3-11) on digital display gain board 231028 (part of RF RANGE switch 299302) until digital readout indicates 0 MHz. Set SCAN WIDTH switch to 200 MHz, RF ATTEN switch to 20 and TUNING control to 1000 MHz. Adjust R1 (band 1 mixer bias) on bias interface J2 board (299344) (Figure 3-12) until all signals are maximized. 

l. It should be noted that in the 0.001 - 2.0 GHz band the YIG preselector (299463) is fixed tuned at 2.287 GHz and a 2-GHz low-pass filter acts as the preselector for this band. Therefore it may be necessary to increase the RF input attenuator in order to avoid overload of the mixer.

m. It will be necessary to set the video offset potentiometer R49 of the preamplifier J4 board 230480 (see Figure 3-10). Adjust R49 for a dc offset of 0 volts at the rear panel "VIDEO OUT" connector. This can be measured with any standard oscilloscope.

3-35. BAND 2 ALIGNMENT

a. Set RF RANGE switch to 1.8 - 4.0 GHz, SCAN WIDTH switch to 200 MHz, and TUNING control to 3000 MHz (as read on digital readout).

b. Adjust R32 and R47 (Figure 3-11) on YIG offset board (230339) and R20 (Figure 3-11) on YIG gains board (299304) until 20 scan lines appear on the screen. (Both boards are part of RF RANGE switch 299302.)

NOTE

There are two responses: one with the YIG VCO on low side of filter (incorrect) and one with the YIG VCO on high side of filter (correct). Clockwise turning of all offset pots increases frequency, therefore, the most clockwise response of R32 to VCO offset and the most counterclockwise response of R47 YIG filter offset is correct.

c. Ground test point on digital display board J3 (299468) with clip lead (Figure 3-13). Digital readout should indicate 3000 MHz; if not, adjust R66 (Figure 3-11) on digital display gain board (231028) (part of RF RANGE switch 299302).

d. Locate 3000-MHz line (center frequency, band 2) with signal generator or frequency meter. Adjust R32 and R47 (Figure 3-11) on YIG offset board (230339) (part of RF RANGE switch 299302) to move this line to center of screen as SCAN WIDTH switch is decreased to 10 MHz.

e. At 200 MHz per division, adjust R20 (Figure 3-11) on YIG gain board (299304) until tracking occurs on first and last graticule lines. Adjust R47 and R20 (Figure 3-11) for best tracking. These controls are optimized when best response occurs with SIGNAL CENTER control at the center of its range.

f. Remove clip lead from test point on J3 board and ensure that 3000 MHz is still on center of screen; adjust TUNING control if not. Then, with SCAN WIDTH switch at 30 MHz, rotate TUNING control slowly counterclockwise and count 100 MHz comb lines until the 2000-MHz line (band 2 lower calibration point) is identified. Center this line at 10 MHz per division and adjust R56 (Figure 3-11) on digital display gain board (231028) until digital readout indicates 2000 MHz. Check 2000-MHz comb line with a frequency meter or signal generator.

g. Adjust R2 (Figure 3-12) on bias interface J2 board (299344) until all signals are maximized.

3-36. BAND 3 ALIGNMENT

- a. Set RF RANGE switch to 3.3 - 8.3 GHz, SCAN WIDTH switch to 200 MHz, TUNING control to 5800 MHz (as read on digital readout), and RF ATTEN switch to 0.
- b. Adjust R29 and R44 (Figure 3-11) on YIG offset board (230339) and R17 on YIG gains board (299304) until 20 scan lines appear on screen. There are two responses: one with the YIG VCO on the low side of the filter (incorrect) and one with the YIG VCO on the high side of the filter (correct). Clockwise turning of all offset pots increases frequency, therefore, the most clockwise response of R29 and the most counterclockwise response of R44 is correct.
- c. Ground test point on digital display board J3 (299468) with clip lead (Figure 3-13). Digital readout should indicate 5800 MHz, if not, adjust R63 (Figure 3-11) on digital display gain board (230335).
- d. Locate 5800-MHz line (center frequency, band 3) with signal generator or frequency meter. Adjust R29 and R44 (Figure 3-11) on YIG offset board (230339) to move this line to center of screen as SCAN WIDTH switch is decreased to 10 MHz.
- e. Set SCAN WIDTH switch to 500 MHz and adjust R17 (Figure 3-11) on YIG gains board (299304) until tracking occurs on first and last graticule lines. Adjust R44 and R17 for best tracking. These controls are optimized when best response occurs with SIGNAL CENTER control at the center of its range.
- f. Remove clip lead from test point on J3 board and ensure that 5800 MHz is still on center of screen; adjust TUNING control if not. Then, with SCAN WIDTH switch at 30 MHz, rotate TUNING control slowly counterclockwise and count 100 MHz comb lines until the 4800 MHz line (band 3 lower calibration point) is identified. Center this line at 10 MHz per division and adjust R54 (Figure 3-11) on digital display gain board (231028) until digital readout indicates 4800 MHz. Set SCAN WIDTH switch to 200 MHz and RF ATTEN switch to 20.
- g. Adjust R3 (Figure 3-12) on bias interface J2 board (299344) until all signals are maximized.

3-37. BAND 4 ALIGNMENT

- a. Set RF RANGE switch to 5.4 - 12.4 GHz, SCAN WIDTH to 200 MHz, TUNING control to 8900 MHz (as read on digital readout), and RF ATTEN switch to 0.
- b. Adjust R26 and R41 (Figure 3-11) on YIG offset board (230339) and R14 on YIG gains board (299304) until 20 scan lines appear on screen. There are two responses: one with the YIG VCO on the low side of the filter (incorrect) and one with the YIG VCO on the high side of the filter (correct). Clockwise turning of all offset pots increases frequency, therefore, the most clockwise response of R26 and the most counterclockwise response of R41 is correct.
- c. Ground test point on digital display board J3 (299468) with clip lead (Figure 3-13). Digital readout should indicate 8900 MHz, if not, adjust R60 (Figure 3-11) on digital display gain board (231028).

d. Locate 8900-MHz line (center frequency, band 4) with signal generator or frequency meter. Adjust R26 and R41 (Figure 3-11) on YIG offset board (230339) to move this line to center of screen as SCAN WIDTH switch is decreased to 10 MHz.

e. Set SCAN WIDTH switch to 700 MHz and adjust R14 on YIG gains board (299304) until tracking occurs on first and last graticule lines. Rotate SIGNAL CENTER control to obtain maximum signal amplitude of comb lines at 10 MHz per division and 200 MHz per division positions. Adjust R41 and R14 (Figure 3-11) for best tracking. These controls are optimized when best response occurs with SIGNAL CENTER control at the center of its range.

f. Remove clip lead from test point on J3 board and ensure that 8900 MHz is still on center of screen; adjust TUNING control if not. Then, with SCAN WIDTH switch at 30 MHz, rotate TUNING control slowly counterclockwise and count 100 MHz comb lines until the 7900-MHz line (band 4 lower calibration point) is identified. Center this line at 10 MHz per division and adjust R52 (Figure 3-11) on digital display gain board (231028) until digital readout indicates 7900 MHz. Set SCAN WIDTH switch to 200 MHz and RF ATTEN switch to 20.

g. Adjust R4 on bias interface J2 board (299334) until all signals are maximized.

3-38. BAND 5 ALIGNMENT

a. Set RF RANGE switch to 10 - 20 GHz, SCAN WIDTH switch to 700 MHz, TUNING control to 15,000 MHz (as read on digital readout), and RF ATTEN switch to 0.

b. Adjust R23 and R38 (Figure 3-11) on YIG offset board (230339) and R89 on YIG gain board (299304) until 20 scan lines appear on screen. There are two responses: one with the YIG VCO on the low side of the filter (incorrect) and one with the YIG VCO on the high side of the filter (correct). Clockwise turning of all offset pots increases frequency, therefore, the most clockwise response of R23 is correct, and the most counterclockwise response of R38 is correct.

c. Ground the test point on digital display board J3 (299468) with clip lead (Figure 3-12). Digital readout should indicate 15,000 MHz, if not, adjust R10 (Figure 3-11) on digital display gains board (231028).

d. Locate 15,000 MHz line (center frequency band 5) with signal generator or frequency meter. Adjust R23 and R38 on YIG offset board (230339) to move this line to center of screen as SCAN WIDTH switch is decreased to 10 MHz.

e. Set SCAN WIDTH switch to 700 MHz and adjust R89 on YIG gains board (299304) until tracking occurs on first and last graticule lines. Rotate SIGNAL CENTER control to obtain maximum signal amplitude of comb lines at 10 MHz per division and 200 MHz per division positions. Adjust R23 and R89 (Figure 3-11) for best tracking. These controls are optimized when best response occurs with SIGNAL CENTER control at the center of its range.

f. Remove clip lead from test point on J3 board and ensure that 15,000 MHz is still on center of screen; if not, adjust TUNING control. Then, with SCAN WIDTH switch at 30 MHz, rotate TUNING control slowly counterclockwise and count 100 MHz comb lines until the 13,000 MHz line (band 5 lower calibration point) is identified. Center this line at 10 MHz per division and adjust R72 (Figure 3-11) on digital display gain board (231028) until digital readout indicates 13,200 MHz. Set SCAN WIDTH switch to 200 MHz.

g. Adjust R5 on bias interface J2 board (299344) and R48 on YIG driver board until all signals are maximized.

h. Switch the FULL RANGE switch to the ON position. It will appear that the tracking has changed by rolling off at the high and low ends. To correct this adjust R51 on YIG driver board for optimum tracking for band 5 only.

3-39. END BAND LIMITS ADJUSTMENT

a. Set the front panel switches and controls to the following settings:

RF RANGE	3.3 - 8.3
RF ATTEN	0
IF ATTEN	10
SCAN WIDTH	200 MHz
BANDWIDTH	
(kHz)	AUTO
VIDEO	AUTO
AMPLITUDE RANGE	10 LOG (dB/DIV)
SCAN MODE	AUTO
BASELINE (outer knob)	Maximum counterclockwise
CONTRAST (inner knob)	Maximum counterclockwise
FULL RANGE (RF RANGE center knob)	OFF
SIGNAL CENTER	Centered
TUNING	Digital readout should read 3300 MHz

b. Adjust R61 (Figure 3-12) on sweep generator J1 board (230216) to blank all signals below 3300 MHz.

c. Set the TUNING control for a digital readout of 8300 MHz. Adjust R60 (Figure 3-12) on sweep generator J1 board (230216) to blank all signals above 8300 MHz.

d. Verify that the 10-GHz and 20-GHz signals are present in band 5. Adjust R61 if the 10-GHz signal is missing and R60 if the 20-GHz signal is missing.

3-40. FULL RANGE MARKER ALIGNMENT

a. Set the front panel switches and controls to the following settings:

RF RANGE	1.8 - 4.0
RF ATTEN	0
IF ATTEN	10
SCAN WIDTH	200 MHz

BANDWIDTH	
(kHz)	AUTO
VIDEO	AUTO
AMPLITUDE RANGE	10 LOG (dB/DIV)
SCAN MODE	AUTO
BASELINE (outer knob)	Maximum counterclockwise
CONTRAST (inner knob)	Maximum counterclockwise
FULL RANGE (RF RANGE center knob)	ON
SIGNAL CENTER	Centered
TUNING	Digital readout should read 3000 MHz

b. Marker should be sitting in center of 3000 MHz line. Turn TUNING control so that the digital readout indicates 3600 MHz. Adjust R55 (Figure 3-12) on sweep generator J1 board (230216) so that the marker sits in the center of the 3600-MHz comb line. Turn FULL RANGE switch to the OFF position.

3-41. LINEARITY ADJUSTMENT

- a. Set the front panel switches and controls to the following settings:

RF RANGE	1.8 - 4.0
RF ATTEN	0
IF ATTEN	As required
SCAN WIDTH	10 MHz
BANDWIDTH	
(kHz)	AUTO
VIDEO	AUTO
AMPLITUDE RANGE	2 LOG (dB/DIV)
SCAN MODE	AUTO
BASELINE (outer knob)	Maximum counterclockwise
CONTRAST (inner knob)	Maximum counterclockwise
FULL RANGE (RF RANGE center knob)	OFF
SIGNAL CENTER	Centered
TUNING	Digital readout should read 3000 MHz

b. Set IF ATTEN switch so that the amplitude of the 3000-MHz comb line covers the full screen. Turn AMPLITUDE RANGE switch to the LIN position. Adjust R46, R37, and R38 on preamplifier board (230480) (Figure 3-10) so that the absolute amplitude of the signal and baseline is the same in LIN as in the 2 dB/div position and that an increase of 10 dB in IF attenuation in the LIN position will cause the signal to drop to the 68 dB graticule on the CRT of the AILTECH 727.

3-42. CATHODE-RAY TUBE ALIGNMENT

Refer to applicable manual for cathode-ray tube alignment procedure.

3-43. SWEEP TIME VERIFICATION

a. Connect a Tektronix 535 or equivalent oscilloscope to SWEEP OUT jack on the rear panel. Set SCAN MODE switch to AUTO, SCAN WIDTH switch to 10 MHz, SCAN TIME switch to 10 μ sec, and RF RANGE switch to 0.001 - 2.0. Measure the scan time for the following SCAN TIME switch positions.

<u>SCAN TIME</u>	<u>Min</u>	<u>Max</u>
10 μ sec	90 μ sec	110 μ sec
100 μ sec	900 μ sec	1100 μ sec
1000 μ sec	9 msec	11 msec
3 msec	27 msec	33 msec
10 msec	90 msec	110 msec

b. Set the TUNING control for 1000 MHz center screen and the SCAN TIME switch to 3 msec. Turn the SCAN TIME switch to 1000 μ sec (TIME DOMAIN). The baseline level should rise indicating that the AILTECH 727 is tuned to one of the 100-MHz comb signals.

3-44. SCAN MODE AND REAR PANEL CHECK

- Turn the SCAN MODE switch through its range and verify that it is working properly.
- Set the following switches on the front panel to the positions indicated:

SCAN WIDTH	10 MHz
BANDWIDTH	
(kHz)	AUTO
IF ATTEN	10
RF ATTEN	0
RF RANGE	1.8 - 4.0
SCAN MODE	EXT TRIG

c. Connect the amplitude calibration output of the Tektronix 535 oscilloscope, set at 1 V/cm, to the EXT TRIG input on the rear panel of the AILTECH 727. The comb lines should be present on the screen of the AILTECH 727.

- d. Move the cable from the EXT TRIG connector to the EXT SWEEP connector. Set the SCAN WIDTH switch to 30 MHz and the SCAN MODE switch to EXT SWEEP. Two lines should be present on the AILTECH 727.
- e. Move the cable from the EXT SWEEP connector to the EXT BLANK connector on the rear panel of the AILTECH 727 and set the SCAN MODE switch to the AUTO position. The display on the AILTECH 727 should be three blanked signals.
- f. Turn the oscilloscope amplitude calibration off and place the cable from the vertical input of the oscilloscope to the BLANK OUTPUT connector on the rear panel of the AILTECH 727. A pulse of approximately 3 volts in amplitude should be present.
- g. Connect the VIDEO OUTPUT connector on the rear panel of the AILTECH 727 to the oscilloscope. With the SCAN MODE switch in the AUTO position, a signal should be present on the oscilloscope. Moving the SCAN MODE switch to VIDEO should remove the signal.

3-45. FILTER RESPONSE VERIFICATION

- a. Check to see that the IF BANDWIDTH (kHz) AUTO select is choosing the proper filters. The proper filters are as follows: (scan time = 3 ms per division).

<u>Scan Width</u>	<u>Filter Chosen</u>
700 through 10 MHz	1 MHz
3 MHz through 300 kHz	100 kHz
100 through 30 kHz	10 kHz
10 through 1 kHz	1 kHz

- b. Set the front panel switches and controls as follows:

RF RANGE	1.8 - 4.0
RF ATTEN	0
IF ATTEN	0
SCAN TIME	3 msec
BANDWIDTH	1000
AMPLITUDE RANGE	10 LOG (dB/DIV)
SCAN WIDTH	1 MHz
SCAN MODE	AUTO
SIGNAL CENTER	Centered
FULL RANGE	OFF

Using an AILTECH 707-90 Comb Generator as an input signal, verify the waveshape of the 1000-kHz filter. If the waveshape is irregular, it can be tuned by varying the two sets of 1-MHz filters in the IF assembly 299350 until a smooth waveshape is obtained.

c. Verify the gain of all four filters in the following manner. Set the SCAN WIDTH switch to 1 kHz while maintaining a signal centered on the screen. Set the BANDWIDTH switch to 1000 kHz. Vary the IF ATTEN switch for a convenient reference, then change the BANDWIDTH switch setting to 100 kHz. Verify that the gain is the same as the 1000-kHz filter ± 1 dB. If not, vary the 100-kHz FILTER GAIN adjustment R17, until the filter gains are of equal amplitude. Repeat the procedure for each of the filters by varying the appropriate FILTER GAIN adjustment as required.

d. The voltage switched attenuators (VSA) control the absolute video gain between bands. They are set as follows. Set the SCAN WIDTH switch to 10 MHz and the RF RANGE switch to 5.4 - 12.4 GHz (band 4). Set the TUNING control so that the digital display reads 11000 MHz. Vary the IF ATTEN switch so that a convenient reference can be set on the display. Switch the RF RANGE switch to the 10 - 20 GHz range (band 5). Set the TUNING control so that the digital display reads 11000 MHz. The amplitude should be the same as in band 4, plus or minus 5 dB. If necessary, vary R41, the band 5 gain adjustment, until the signals are well within the stated tolerance. Repeat the procedure for each band using a signal that can be realized in both bands.

NOTE

Make sure that the YIG filter is tracking properly about the signals being used by peaking the signal. This is done by varying the SIGNAL CENTER control for maximum amplitude of the signal.

3-46. LCVCO ALIGNMENT

CAUTION

Do not perform this alignment if the LCVCO is working properly. This alignment is very critical, requires special equipment, and should not be attempted unless the LCVCO is known to be out of alignment or a malfunction of the LCVCO has occurred and a repair has been made.

a. Set the front panel switches and controls to the following positions:

RF RANGE	1.8 - 4.0
RF ATTEN	0
IF ATTEN	0
SCAN TIME	3 msec
BANDWIDTH (kHz)	10
AMPLITUDE RANGE	10 LOG (dB/DIV)
SCAN WIDTH	1 MHz
SCAN MODE	AUTO
SIGNAL CENTER	Centered
FULL RANGE	OFF

- b. Open RF deck for access to the LCVCO assembly (230543). Set R18 (SLOPE) and R17 (POSITION) on LCVCO shaper (230595) (part of LCVCO assembly 230543) to fully counterclockwise.
- c. Set SCAN WIDTH switch to 300 kHz and set R22 (GAIN) on LCVCO shaper fully counterclockwise. Disconnect the cable to the 227 MHz filter (299376) input and apply 1-MHz comb lines by connecting a cable from an HP-8406 comb generator. Use the 20 - 200 MHz output. Observe the lines on the AILTECH 727 screen. Adjust C2 (MAIN TUNING) on LCVCO oscillator II (230532) (part of LCVCO assembly 230543) to center lines about the 227-MHz filter response. Adjust C1 (FEEDBACK) and C4 (OUTPUT TUNING) on LCVCO oscillator II (230532) for best linearity (even spacing of comb lines). It may be necessary to readjust C2 (MAIN TUNING). Usually the spacing of the right side of the display will be expanded.
- d. Adjust R22 (GAIN) so as to line up comb lines on as many graticule markers as possible. A minimum of six lines is required. Use R17 (POSITION)/SLOPE and R18 (SLOPE) for best linearity. These will reduce the expanded right side.
- e. Identify the 227-MHz line by selecting 10-MHz comb lines (third line right of the 230-MHz line). Select 1-MHz comb lines again. Increase R22 (GAIN) so that the line spacing is approximately 3.3 divisions. Put the 227-MHz line to center by adjusting C2 (MAIN TUNING). Adjust TUNING control and R22 (GAIN) to obtain exactly four 1-MHz lines for 10 divisions with the SCAN WIDTH switch set to 300 kHz.
- f. Reset TUNING control to center and check to make sure that 227-MHz line is still at center. With SCAN WIDTH switch set to 1 MHz, measure the power at 248-MHz test port on the LCVCO assembly; it should be between -5 dBm and 0 dBm.

3-47. PHASE-LOCK ALIGNMENT

Assuming the existence of a working 3.5 MHz limiting IF amplifier, a working comb generator and associated mixers, piping, and hardware in proper order, phase lock is aligned as follows:

- a. Connect a Tektronix 502 oscilloscope using the differential dc input across the 10-ohm sampling resistor R60 located on the J18 YIG driver board (299400).
- b. Set R36 on the J18 YIG driver board fully counterclockwise.
- c. Set R32 on the J18 YIG driver board fully counterclockwise.
- d. Put a 3-GHz S-band signal into the RF INPUT jack on the AILTECH 727. Ground 8 Hz oscillator terminal on loop casting.
- e. Disconnect J-3 connector from Digital Display board.

f. Change Scan Width to 1 MHz/div. Tune a signal to the center of the screen. Using the oscilloscope measure the voltage across the 10 resistor. We will call this voltage "X". Place this value into the following equation:

$$\left(\frac{X}{10} \right) 1.75 = Y \text{ mV}$$

Y is the value to be used for setting the primary loop gain for this analyzer. Set width to 300 kHz/div.

g. Adjust R32 CW while moving the signal on the display from left to right with signal center pot, so that a voltage displacement on either side of zero is "Y" mV as seen on the 502 oscilloscope, that is $\pm$ "Y" mV. It should now be possible to adjust the signal center control to "skip" the displayed signal from line to line either side of center without depressing the signal center pot switch. Now adjust R36 slowly in a CW direction until the signal cannot be moved when the signal center pot is turned to either extreme in the undepressed mode. The voltage displacement as seen on the 502 oscilloscope in the depressed mode should be ± 40 mV.

h. Turn unit off and reconnect the digital display board. Turn unit on and set the scan width to 100 MHz/div.

3-48. Auto Centering

- a. Set the RF Range Switch (S3) to Band 4 with 8000 MHz in the center of the screen.
- b. Set the scan width to 100 MHz/div. Monitor TP1 on the AUTO Centering board using a Digital Voltmeter.
- c. Adjust R9 on the Auto Centering until the voltmeter reads $0V \pm 10$ mV.
- d. Set the Scan Width to 1 MHz/div and center a signal on the screen of the analyzer.
- e. Change the Scan Width to 300 kHz/div. The signal should snap close to the center of the screen. If it doesn't vary R15 on the Auto Centering board until the signal does come to the center of the screen.
- f. Switch to 1 MHz/div. and center the signal.
- g. Switch back to 300 kHz/div. The signal should snap back to the center.
- h. Verify that acquisition occurs in all Bands -2 divisions from center.

3-49. FM Calibration

- a. Check the FM resistor on the Yig Driver Board by setting the Analyzer's Scan Width to 1 MHz/div. and the IF Bandwidth to 10 kHz/div. in Band 2. Using the Hewlett-Packard 8406A set at 1 MHz, ten lines should appear, one per division. If not, use a decade box to vary the resistance until a comb line appears on every graticule.

3-50. VSA

- a. Set the analyzer to Band 4 with Fo at 11 GHz. Set the RF Attenuator to 0 dB and the IF Attenuator to some convenient reference such that the 11 GHz comb line falls on a horizontal division line.
- b. Switch the analyzer to Band 5 with Fo at 11 GHz. Adjust the Band 5 VSA until the signal returns to the reference level of paragraph 19.1
- c. Return to Band 4 and set the analyzer Fo to 7 GHz and set a convenient reference as in paragraph 19.1. Switch the analyzer to Band 3 and set the Band 3 VSA.
- d. Repeat for appropriate bands. NOTE: In Band 1 put 20 dB on the RF attenuator before setting the Band 1 VSA.

3-51. 100 MHz Cal. Out

- a. Using a signal generator, and a power meter, and another Spectrum Analyzer set a reference at 100 MHz @ -30 dBm on the other Spectrum Analyzer.
- b. Take the 100 MHz output of the 727 and place it into the input of the reference analyzer. Compare amplitudes.
- c. If they are not equal ± 5 dB, adjust the 100 MHz adjust pot of the 100 MHz oscillator until it meets the ± 5 dB spec.

3-52. Auxiliary Power Connector (Back Panel)

Check J25 for the following connections:

J25	
Pin 1	J1-12
3-4-5	Ground
Pin 14	Sweep Out
16	+18 VDC
18	Video Out
20	-18 VDC
22	Blanking Out

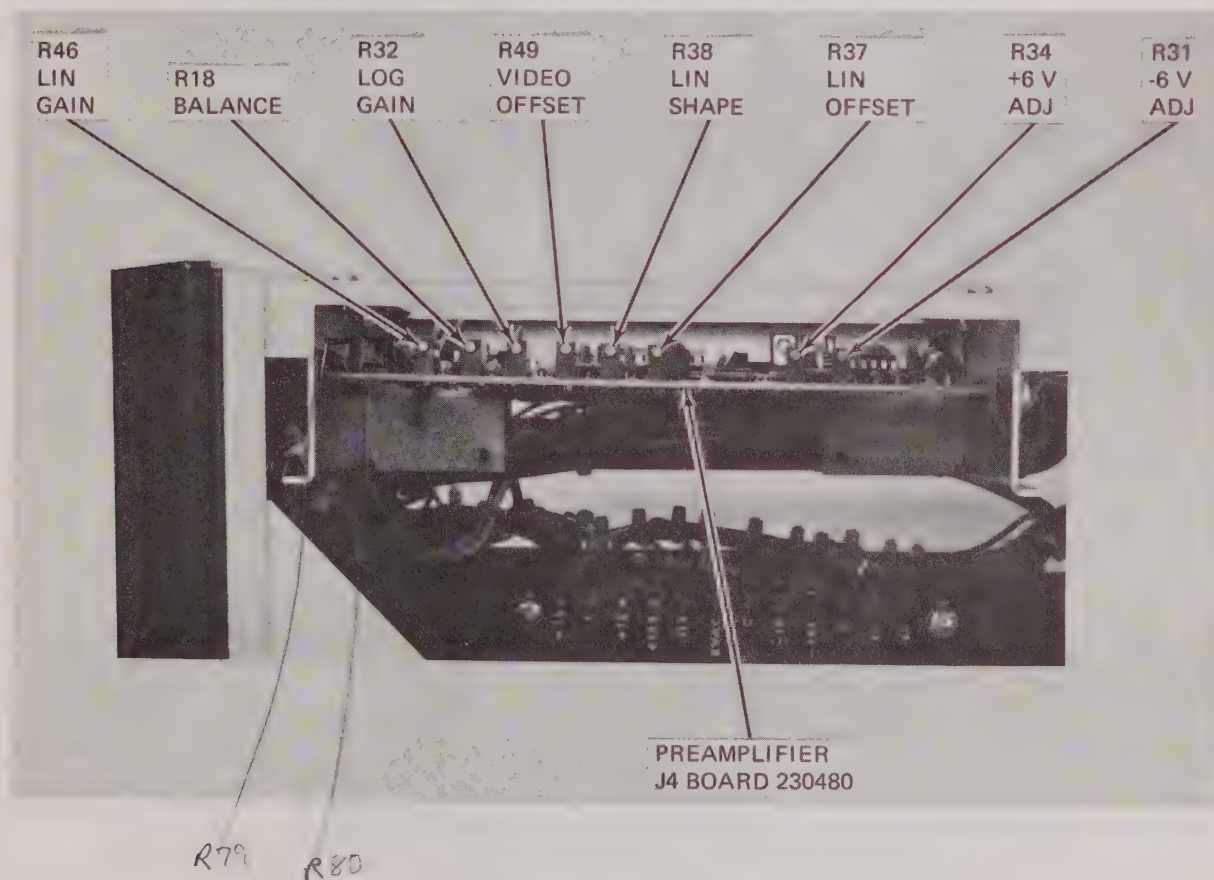


Figure 3-10. Preamplifier J4 Board (230480), Adjustment Locations

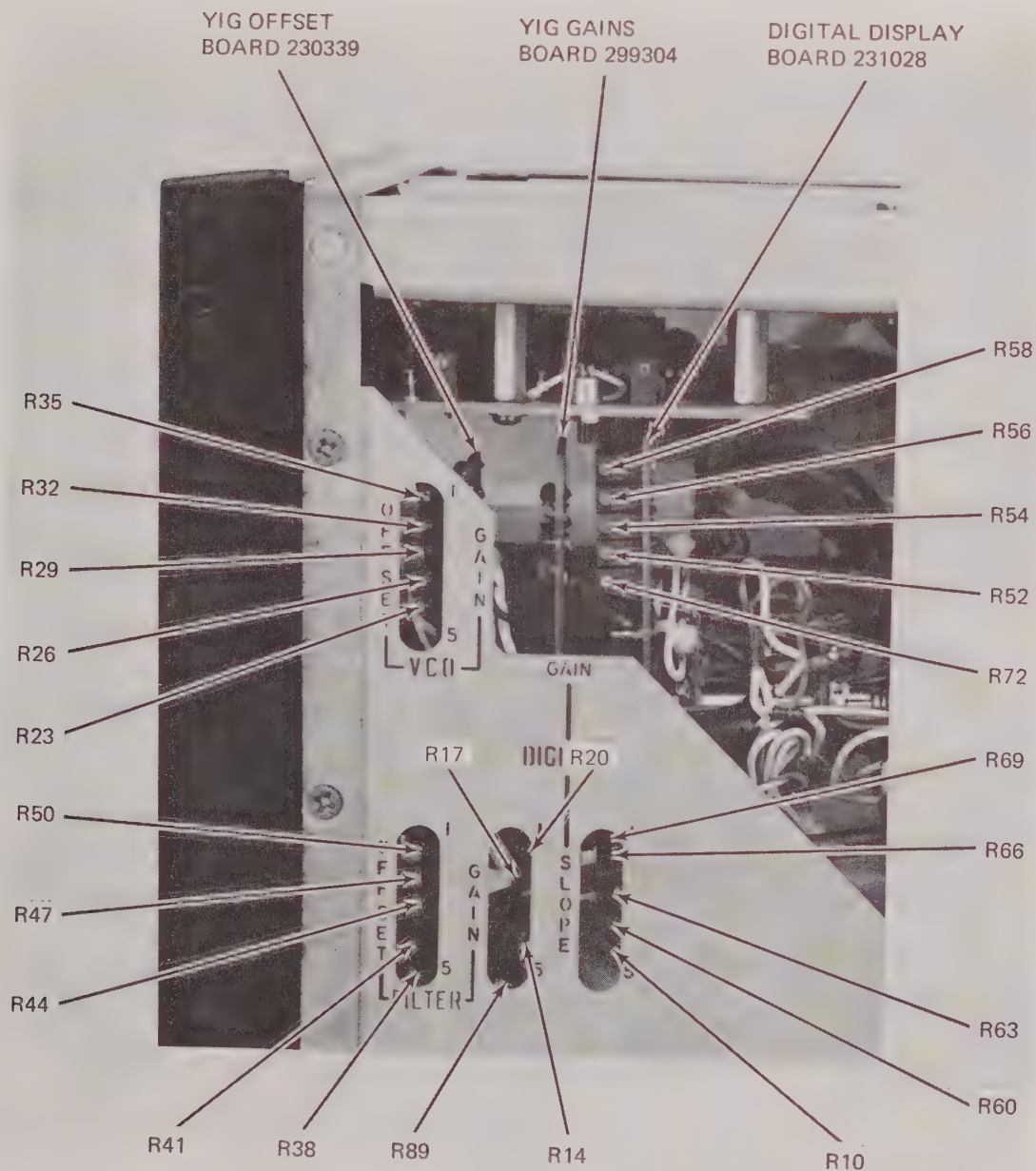
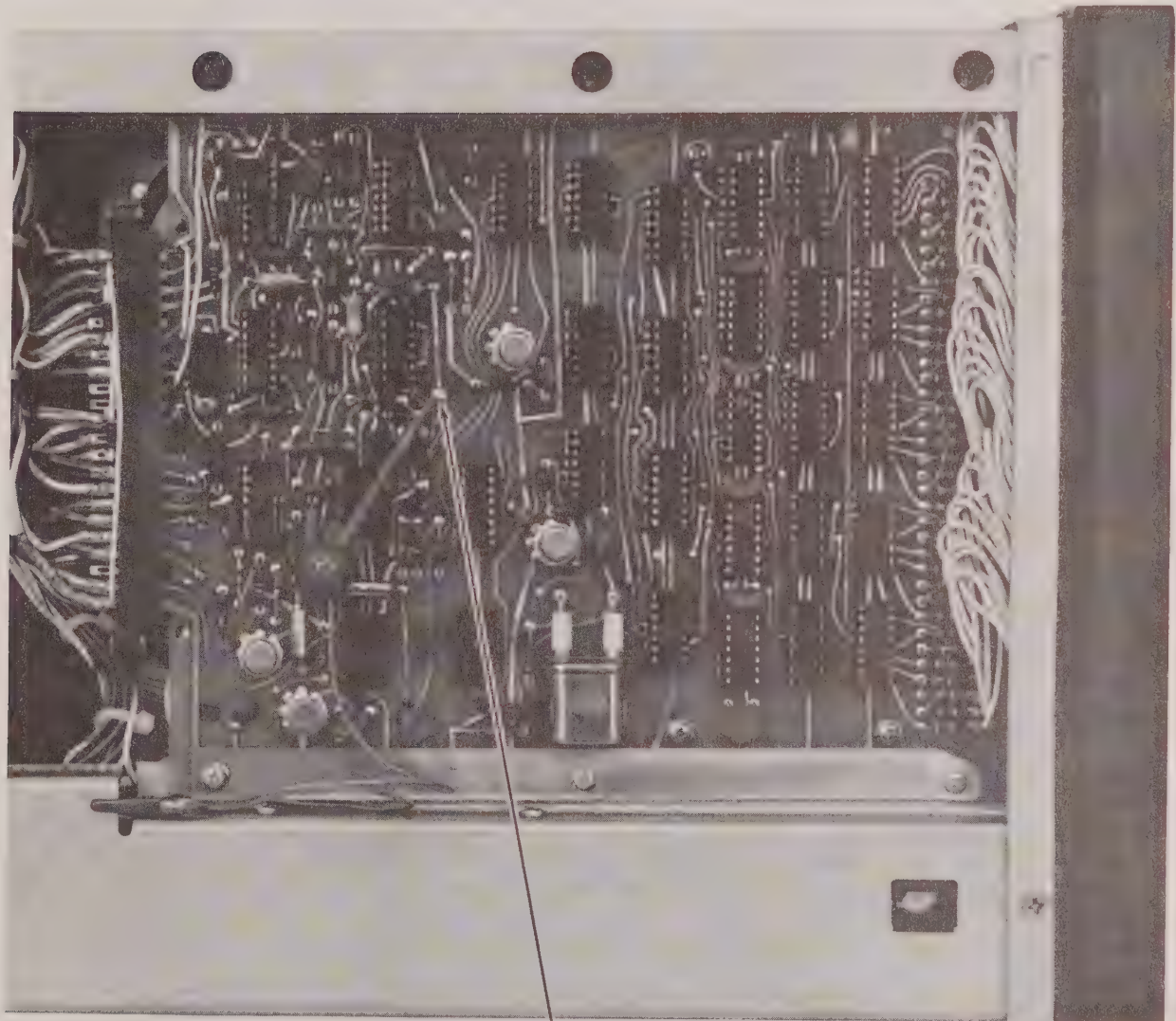


Figure 3-11. RF RANGE Switch (299302),
Adjustment Locations



GROUNDING
CONNECTION

Figure 3-13. Grounding Connection on Digital Display J3 Board (299468)

3-53. DRAWINGS

Block diagrams, wiring diagrams, and connector pin location diagrams are provided here as an aid to troubleshooting and isolation of faulty components. It should be noted that schematic diagrams and parts location illustrations and parts lists are found in Chapter 4 of this manual. The drawings provided here are listed below.

- Figure 3-14. AILTECH 727 Spectrum Analyzer Detailed Block Diagram
- Figure 3-15. AILTECH 727 Spectrum Analyzer Wiring Diagram
- Figure 3-16. Display Unit Wiring Diagram
- Figure 3-17. SCAN WIDTH Switch S1 Wiring Diagram
- Figure 3-18. SCAN TIME Switch S2 Wiring Diagram
- Figure 3-19. RF RANGE Switch S3 Wiring Diagram
- Figure 3-20. BANDWIDTH Switch S4 Wiring Diagram
- Figure 3-21. AMPLITUDE RANGE Switch S5 Wiring Diagram
- Figure 3-22. SCAN MODE Switch S6 Wiring Diagram
- Figure 3-23. Tuner Assembly Wiring Diagram
- Figure 3-24. PC Board Connector Pin Locations

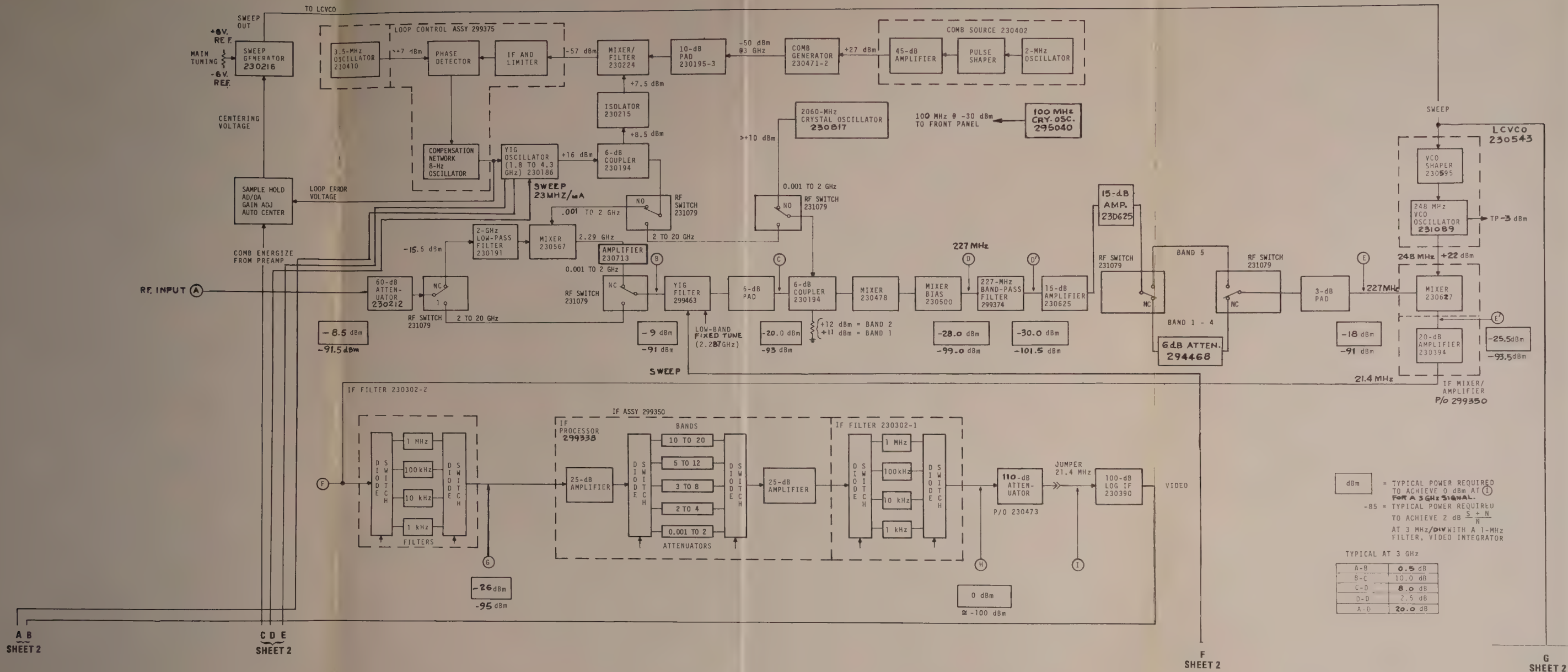


Figure 3-14. AILTECH 727 Spectrum Analyzer Detailed Block Diagram (Sheet 1 of 2)

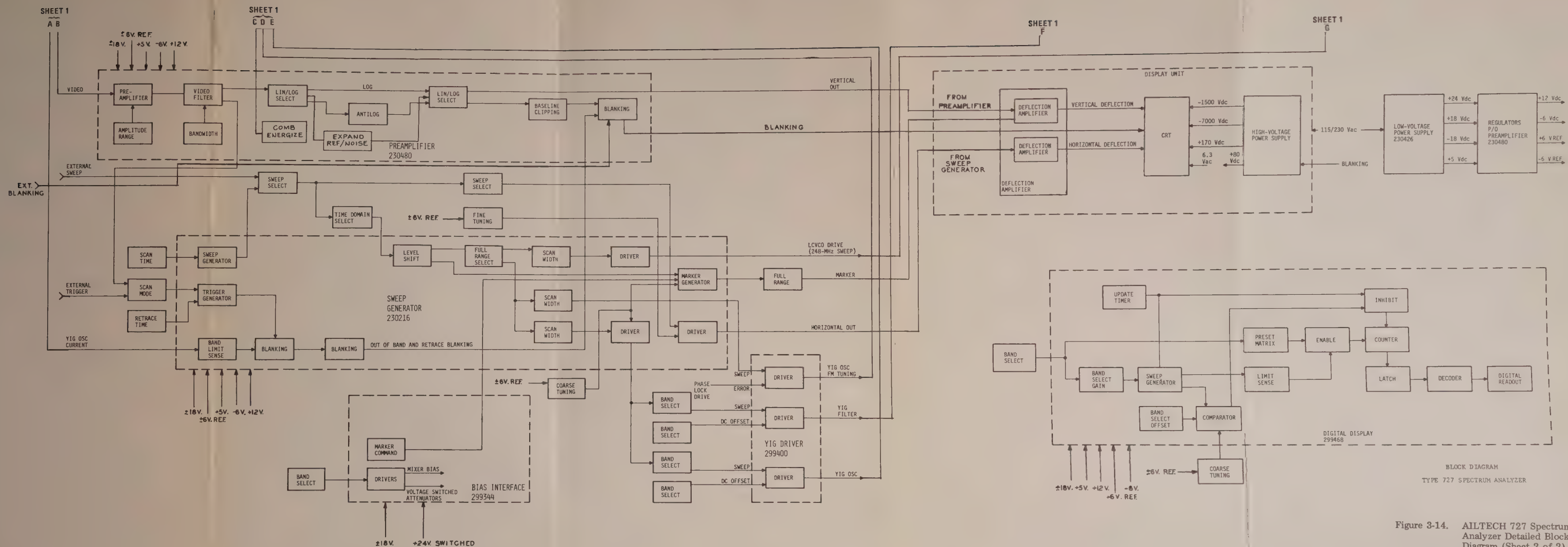


Figure 3-14. AILTECH 727 Spectrum Analyzer Detailed Block Diagram (Sheet 2 of 2)

Note: Pages 3-55 and 3-56 are intentionally left blank.

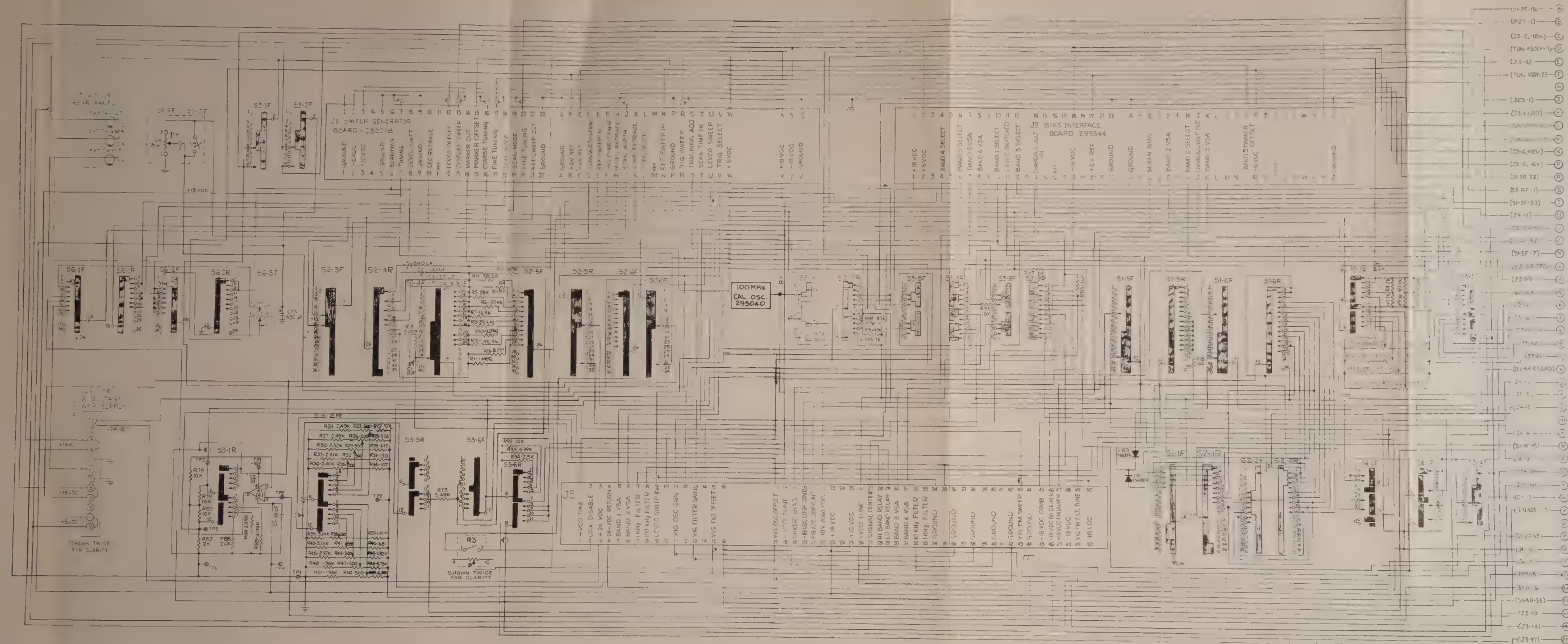
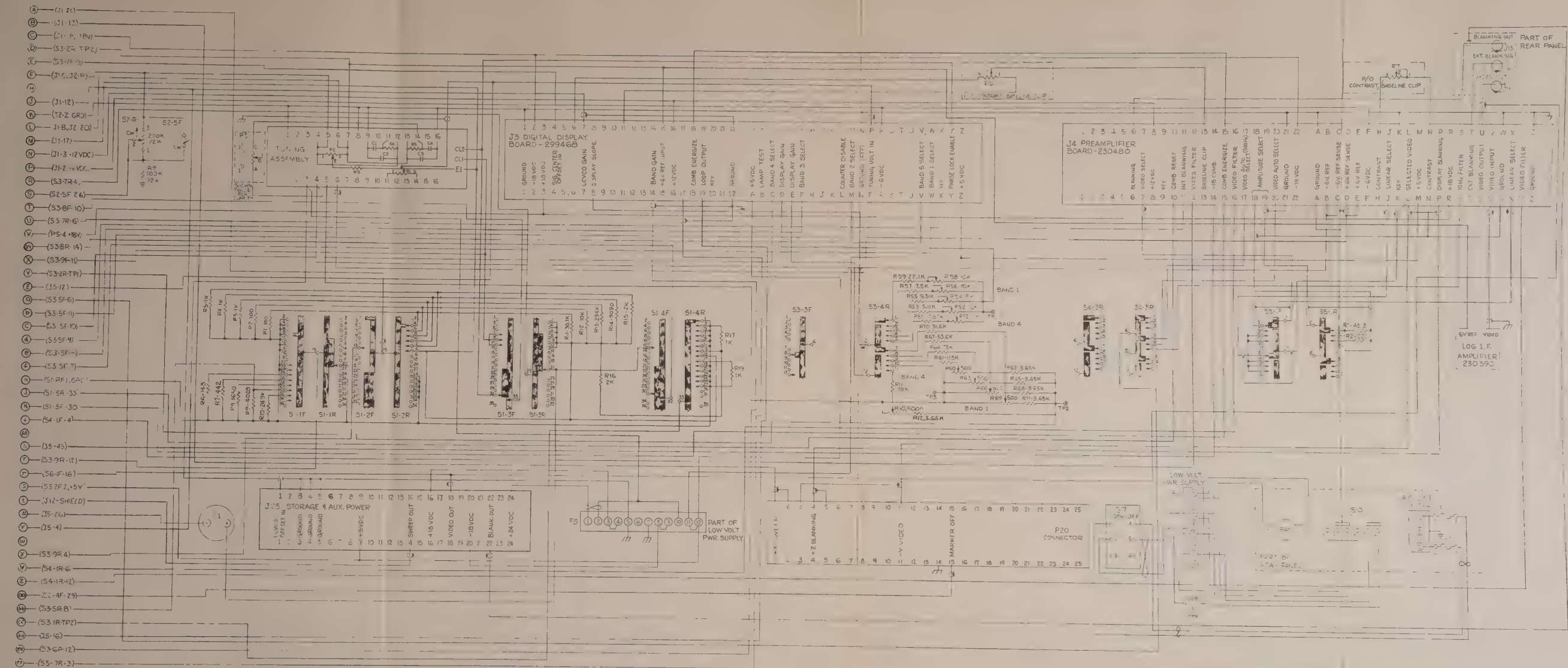


Figure 3-15. AILTECH 727 Spectrum Analyzer Wiring Diagram (Sheet 1 of 3)



WIRING DIAGRAM
TYPE 727 MAIN FRAME
00752 295030
SCALE REV SHEET 1 OF 3

Figure 3-15. AILTECH 727 Spectrum Analyzer Wiring Diagram (Sheet 2 of 3)

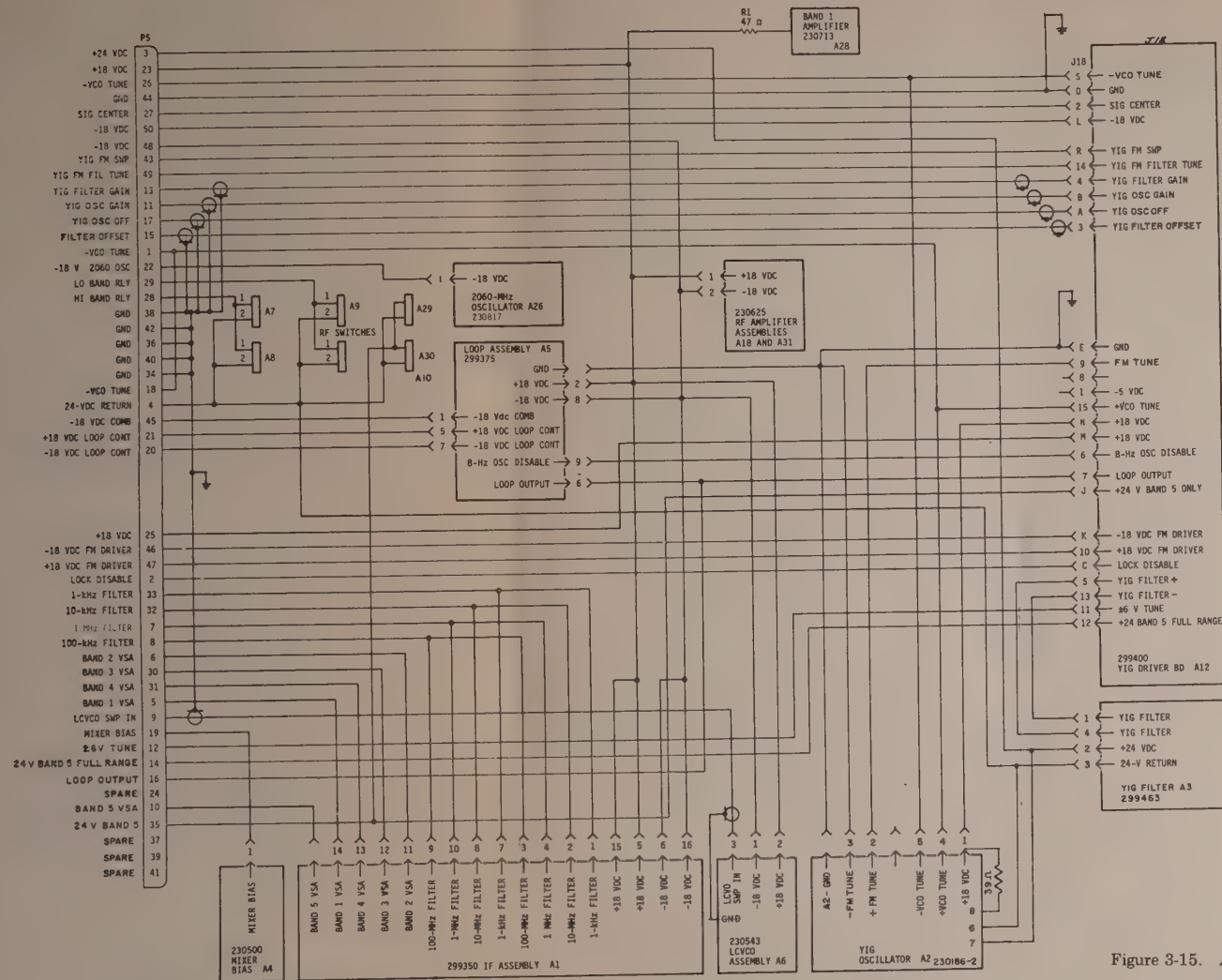


Figure 3-15. AILTECH 727 Spectrum Analyzer Wiring Diagram (Sheet 3 of 3)

(Refer to applicable Display manual.)

Figure 3-16. Display Unit Wiring Diagram

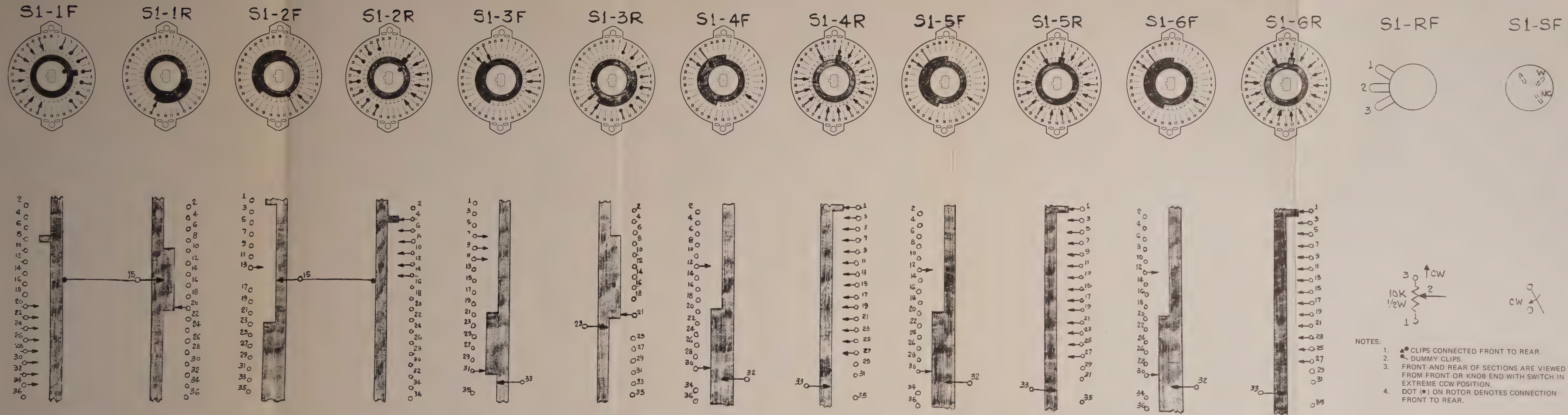
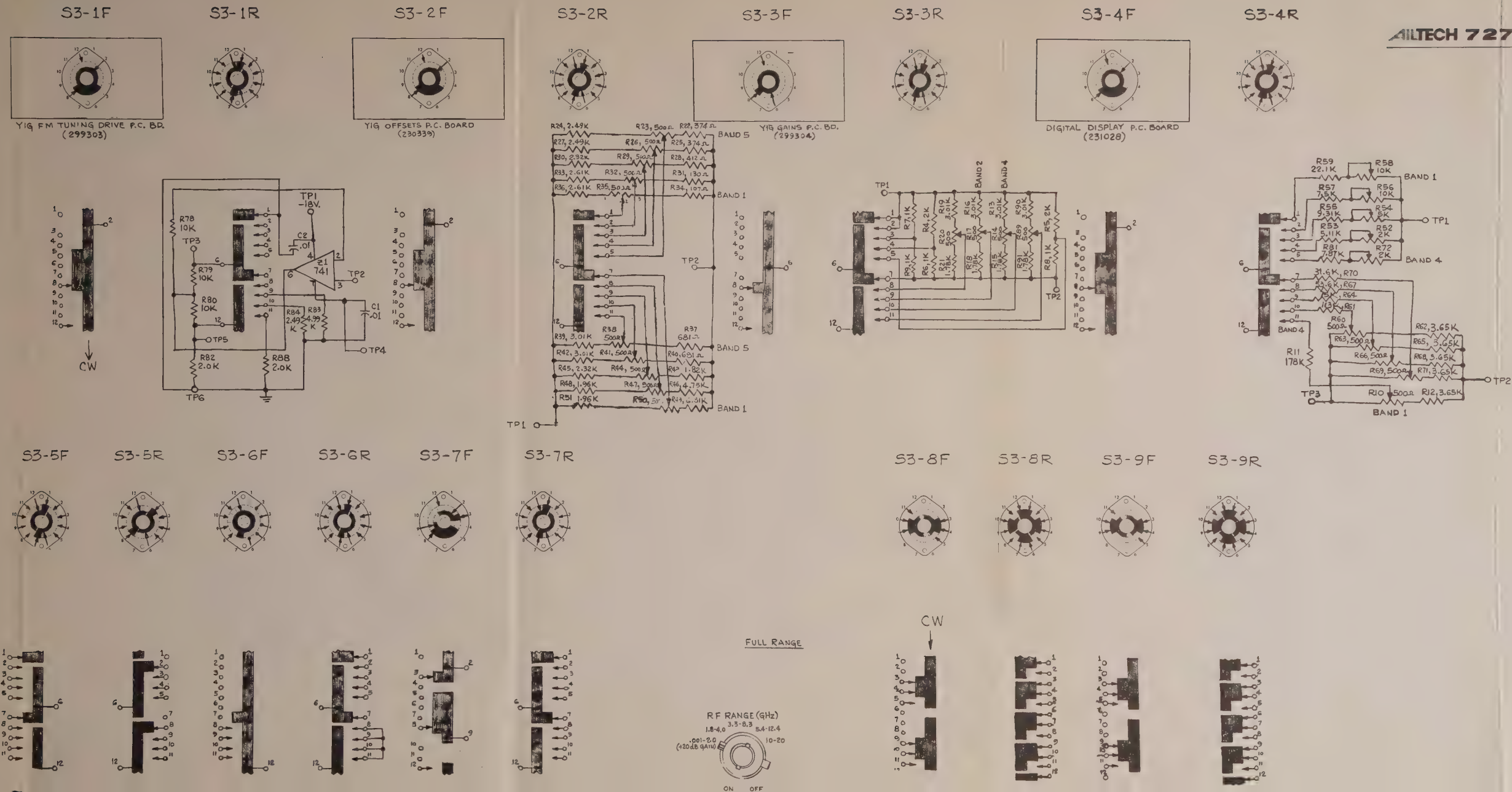
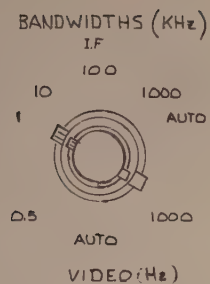


Figure 3-17. SCAN WIDTH Switch S1 Wiring Diagram







S4-1F



S4-1R



S4-2R

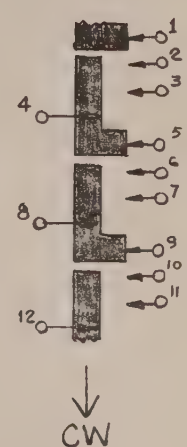
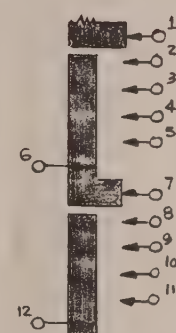
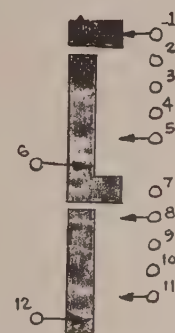
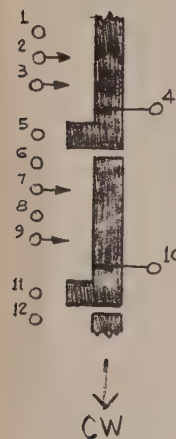


S4-3R



IF

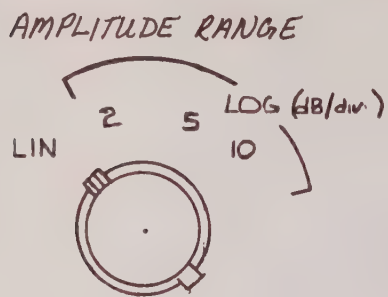
VIDEO



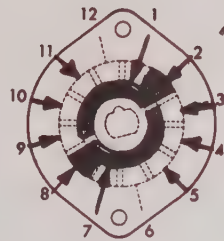
NOTES:

1. ▲ CLIPS CONNECTED FRONT TO REAR.
2. ● DUMMY CLIPS.
3. FRONT AND REAR OF SECTIONS ARE VIEWED FROM FRONT, OR KNOB END, WITH SWITCH IN EXTREME CCW POSITION.

Figure 3-20. BANDWIDTH Switch S4 Wiring Diagram



S5-1F



S5-1R

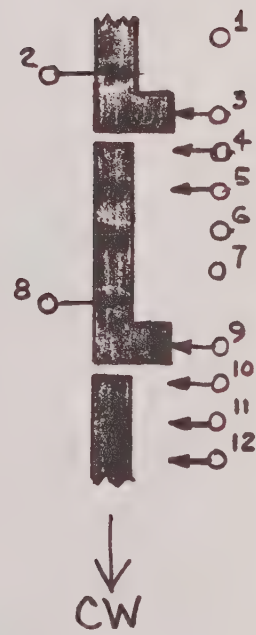
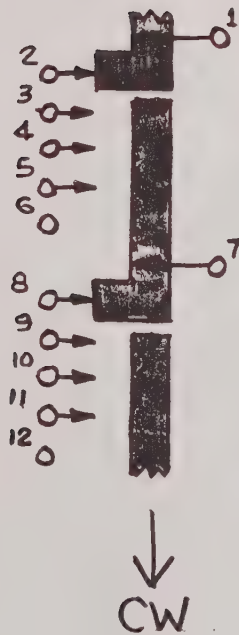
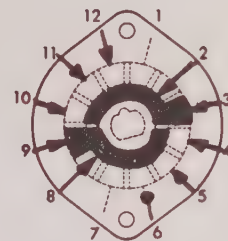
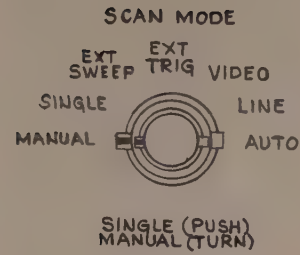


Figure 3-21. AMPLITUDE RANGE Switch S5
Wiring Diagram



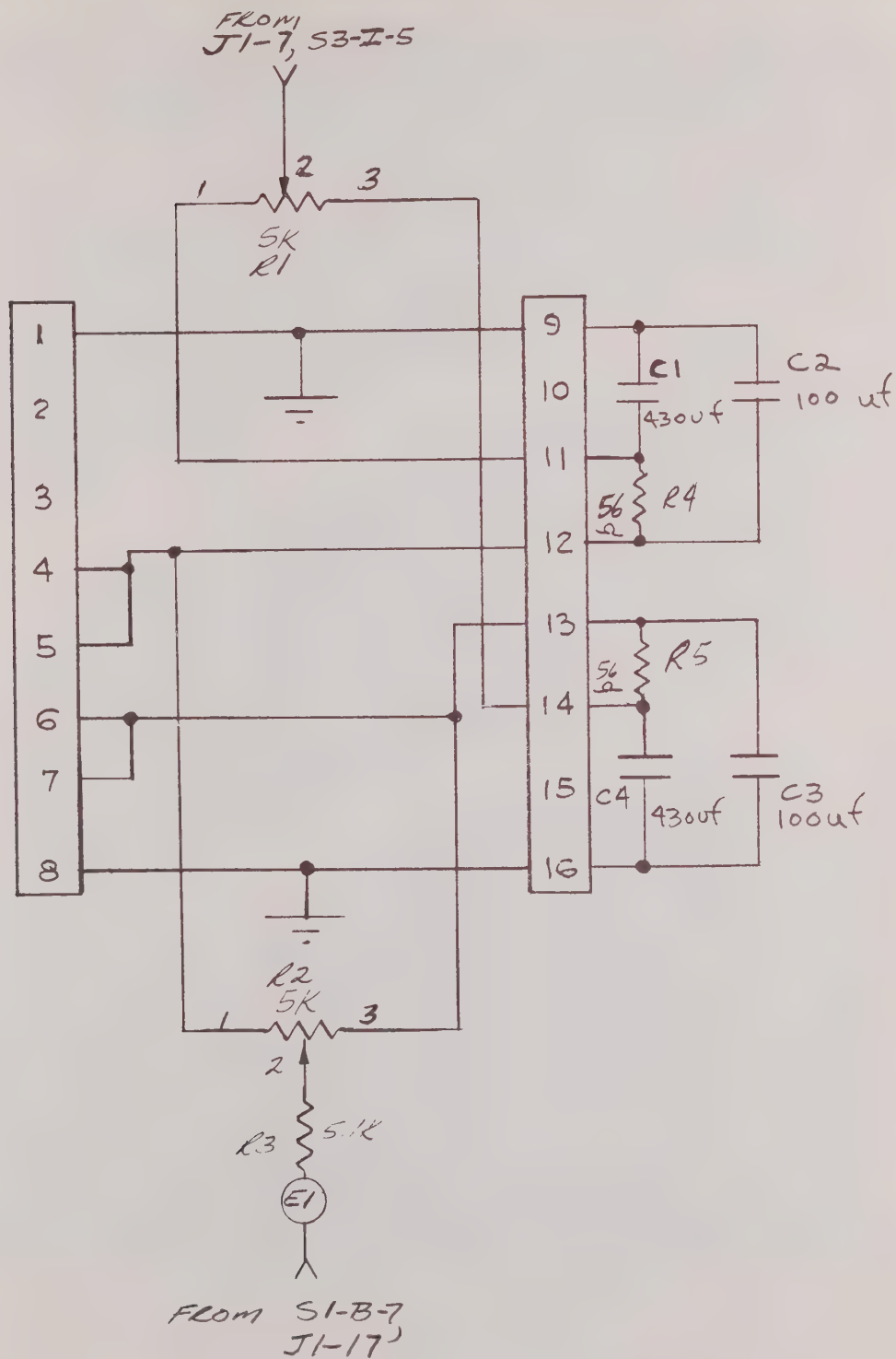


Figure 3-23. Tuner Assembly Wiring Diagram

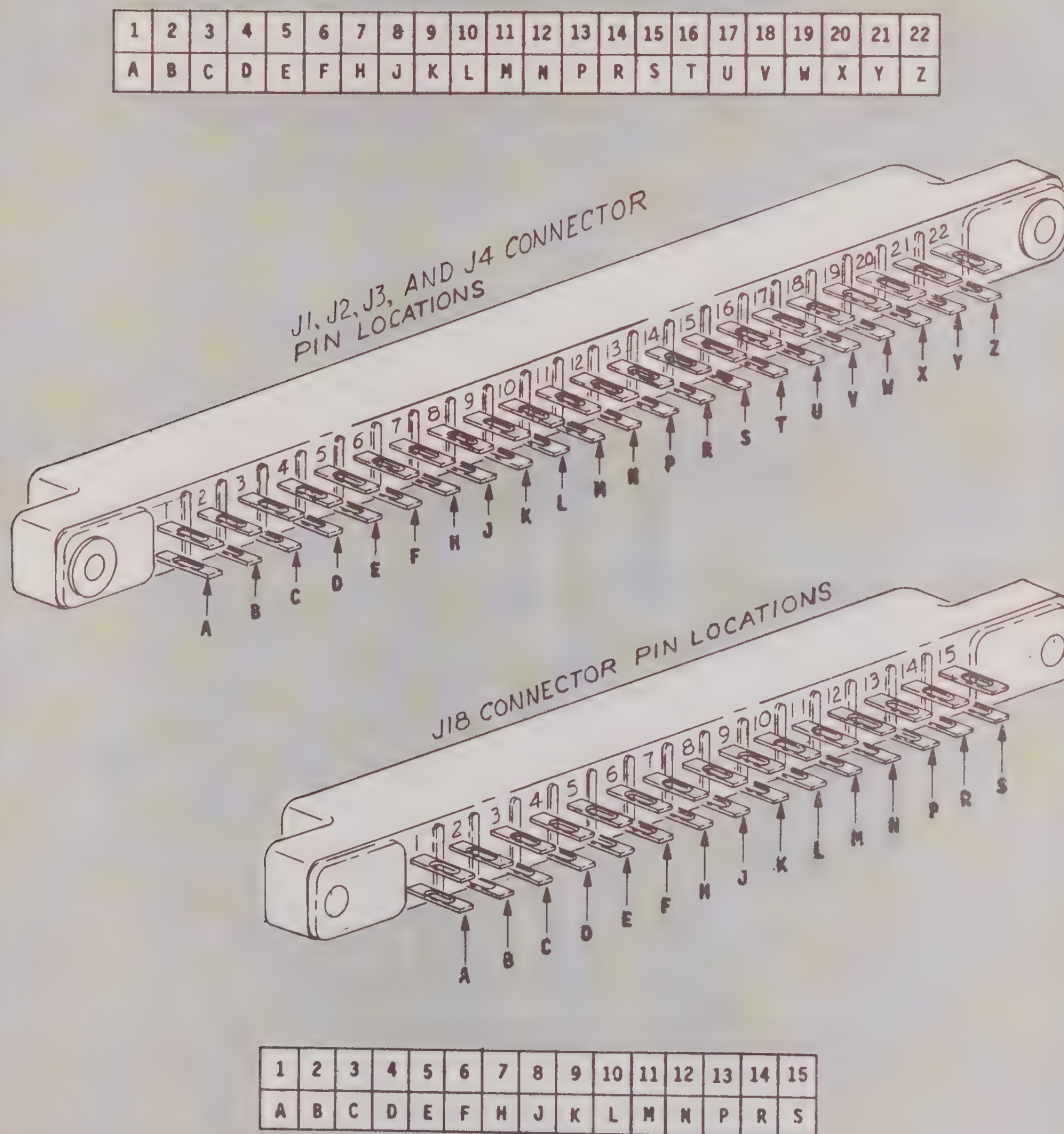


Figure 3-24. PC Board Connector Pin Location

CHAPTER 4

PARTS LOCATION

SECTION I. GENERAL

The preliminary information in this chapter consists of photographs and schematic diagrams which identify and locate most of the replaceable electrical components. A complete parts list will be provided at a later date. Refer to Table 4-1 for the federal manufacturers code to name conversions.

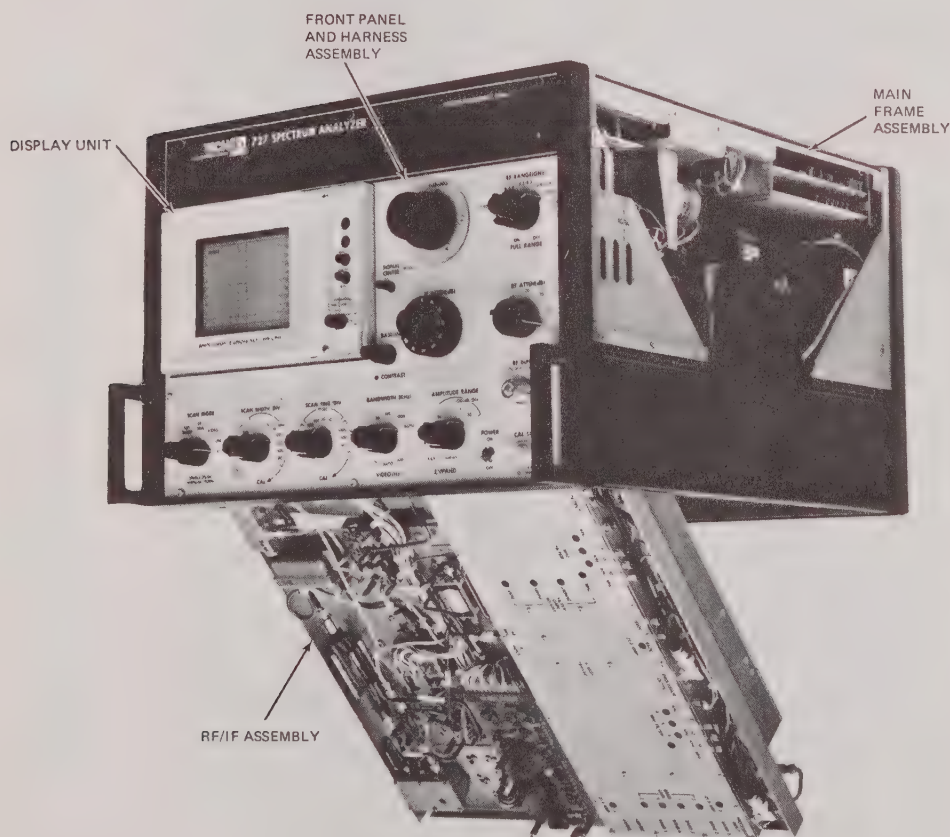


Figure 4-1. AILTECH 727 Spectrum Analyzer Component Parts

Table 4-1. Federal Supply Code Manufacturer (FSCM)

<u>FSCM</u>	<u>Manufacturer</u>	<u>City - State</u>	<u>Zip Code</u>
00141	PIC Design Corp.	Ridgefield, CT.	06877
00656	Aerovox Corp.	New Bedford, MA.	02741
00752	AIL Div. of Cutler Hammer	Deer Park, N.Y.	11729
01121	Allen Bradley Co.	Milwaukee, WI.	53212
01295	Texas Instruments, Inc.	Dallas, TX.	75222
02660	Bunker Ramo Corp.	Broadview, IL.	60153
03508	General Elect. Co.	Syracuse, N.Y.	13201
04072	Bell Industries, Inc.	Compton, CA.	90224
04213	Baddell-Burns Mfg. Co.	Mineola, N.Y.	11501
04713	Motorola, Inc.	Phoenix, AZ.	85008
05245	Corcom, Inc.	Chicago, IL.	60657
05397	Kemet	Cleveland, OH.	44100
05420	General Time	Thomaston, CT.	06787
50507	Micronetworks	Worcester, MA.	01606
05820	Wakefield Eng. Inc.	Wakefield, MA.	01880
05955	Edko Electronics, Inc.	Brooklyn, N.Y.	11211
06540	Amatom Electronic	New Haven, CT.	06515
07047	Ross Milton Co., The	Southampton, PA.	18966
07263	Fairchild Semiconductor	Mountainview, CA.	94040
07556	Calabro Plastics, Inc.	Darby, PA.	19082
07886	National Radio Co.	Melrose, MA.	02176
08730	Vemaline Products Co.	Wyckoff, N.J.	07481
09004	Transistor Devices Inc.	Cedar Knolls, N.J.	07927
09969	Dale Electronics Inc.	Yankton, SD.	57078
11532	Teledyne	Horthorn, CA.	90250
13103	Thermaloy Co.	Dallas, TX.	75234
14099	Semtech Corp.	Newbury Park, CA.	91320
14655	Cornell-Dubilier Electronics	Newark, N.J.	07101
16428	Beldin Corp.	Richmond, IN.	47374
16733	Phelps Dodge Communications Co.	North Haven, CT.	06473
19647	Caddock Electronics, Inc.	Riverside, CA.	92507
23936	Pamator Div. William J. Purdy Co.	Burlingame, CA.	94010
24211	Gribsby Barton	Rolling Meadows, IL.	60008
25403	Amperex Electronic Corp.	Slatersville, RI.	02876
26742	Methode Electronics Inc.	Chicago, IL.	60656
27193	Cutler Hammer Inc., Specialty Prod. Div.	Milwaukee, WI.	53216
27264	Molex Products Co.	Downers Grove, IL.	60515
27907	Plastimatic Inc.	West Nyack, N.Y.	10994
29604	Stackpole Components Co.	Raleigh, N.C.	27610
31439	Datel	Canton, MA.	02021
46384	Penn Engineering and Mfg. Co.	Doylestown, PA.	18901
49956	Raytheon Co.	Lexington, MA.	02173
50056	Gulton Industries Inc.	Metuchen, N.J.	08840
50436	Hewlett-Packard Co.	Palo Alto, CA.	94304
50507	Micronetworks	Worcester, MA.	01604
50930	Acushnet Capacitor Co.	Bedford, MA.	02741
56289	Sprague Electric Co.	North Adams, MA.	01247
70485	Atlantic India Rubber Works Inc.	Chicago, IL.	60607

Table 4-1. Federal Supply Code Manufacturer (FSCM) (cont.)

<u>FSCM</u>	<u>Manufacturer</u>	<u>City - State</u>	<u>Zip Code</u>
71279	Cambridge Thermionic Corp.	Cambridge, MA.	02138
71400	Bussman Mfg.	St. Louis, MO.	63107
71450	CTS Corp.	Elkhart, IN.	46514
71590	Centralab Electronics	Milwaukee, WI.	53201
71744	Chicago Miniature Lamp Works	Chicago, IL.	60640
71785	TRW Electronic Components	Elk Grove Village, IL.	60007
71895	Delavan Mfg. Co.	West Des Moines, IA.	50265
72136	Electro Motive Mfg. Co.	Williamantic, CT.	06226
72619	Dialight	Brooklyn, N.Y.	11237
72962	Elastic Stop Nut Div.	Union, N.J.	07083
72982	Erie Technological Products Inc.	Erie, PA.	16512
73899	JED Electronics Corp.	Brooklyn, N.Y.	11219
74389	Ulanet George Co.	Newark, N.J.	07105
74868	Bunker Ramo Corp.	Danbury, CT.	06810
74970	Johnson, E.F. Co.	Waseca, MN.	56093
75042	TRW Electronic Components	Philadelphia, PA.	19108
75382	Kulka Electric Corp.	Mt. Vernon, N.Y.	10550
75915	Littlefuse, Inc.	Des Plaines, IL.	60016
78488	Stackpole Carbon Co.	St. Mary's, PA.	15857
78553	Tinnerman Products, Inc.	Cleveland, OH.	44129
79136	Waldes Kohindoor Inc.	Long Island City, N.Y.	11101
79963	Zierick Mfg. Co.	Mt. Kisco, N.Y.	10549
80058	Joint Electronic Type Des. System		
80294	Bourns Inc. Instrument Div.	Riverside, CA.	92506
81073	Grey Hill	La Grange, IL.	60525
81349	Military Spec. Promulgated by Military Depts.		
81844	Guardian Electric Mfg. Co.	Culver City, CA.	90230
82877	Rotron, Inc.	Woodstock, N.Y.	12498
83330	Smith, Herman H. Co.	Brooklyn, N.Y.	11207
83553	Associated Spring Corp.	Gardena, CA.	90248
88044	Aeronautical Standards Group Dept.		
91506	Augat Inc.	Attleboro, MA.	02703
91833	Keystone Electronics Corp.	New York, N.Y.	10012
95263	Leecraft Mfg. Co. Inc.	Long Island City, N.Y.	11101
95354	Methode Manufacturing Corp.	Rolling Meadows, IL.	60008
97469	Airco Speer Carbon, Graphite Div.	Niagara Falls, N.Y.	14302
98291	Sealectro Corp.	Mamaroneck, N.Y.	10544
99800	American Precision Ind. Inc.	East Aurora, N.Y.	14052

AILTECH 727 SPECTRUM ANALYZER COMPONENT PARTS

<u>Item</u>	<u>Description</u>	<u>Manufacturer</u>	<u>Part No.</u>
AT1	RF Attenuator (see Figure 4-2)	00752	230212
B1	Fan, Axial (see Figure 4-23)	82877	M747
B1W1	Plug and Cord (see Figure 4-23)	82877	16415
C1	Capacitor, powerlytic 4600 μ F 15 V (see Figure 4-15)	56289	36D462G015AA2A
FL1	AC Line Filter (see Figure 4-23)	05245	3B4
F1, F2	Fuse, Slo-Blo, 3 amp 125 V (see Figure 4-23)	75915	313003
PS1	Power Supply (see Figure 4-21)	00752	230426-1
S7/R3	Resistor, variable, 10 K push-pull switch (see Figure 4-2)	71450	VY9810
W1	Cable Assembly, RF input (see Figure 4-2)	00752	230633-23
W2	Cable Assembly (see Figure 4-2)	00752	230633-22
	Sweep Generator J1 Board (see Figure 4-16)	00752	230216
	Tuner Assembly (see Figure 4-14)	00752	299137-1
	Digital Display J3 Board (see Figure 4-18)	00752	299468
	Bias Interface Board	00752	299344
	Tuner/Voltage Ref. Assembly	00752	299480-1
	Automatic Centering Board	00752	299378
	RF/IF Assembly	00752	299352
	100 MHz Cal. Oscillator Assy.	00752	295040
	RF Range (GHz) Switch S3 (see Figure 4-5)	00752	230334
	Log IF Amplifier (see Figure 4-22)	00752	230390
	IF Attenuator Assembly (see Figure 4-13)	00752	299367
	Preamplifier J4 Board (see Figure 4-20)	00752	230480

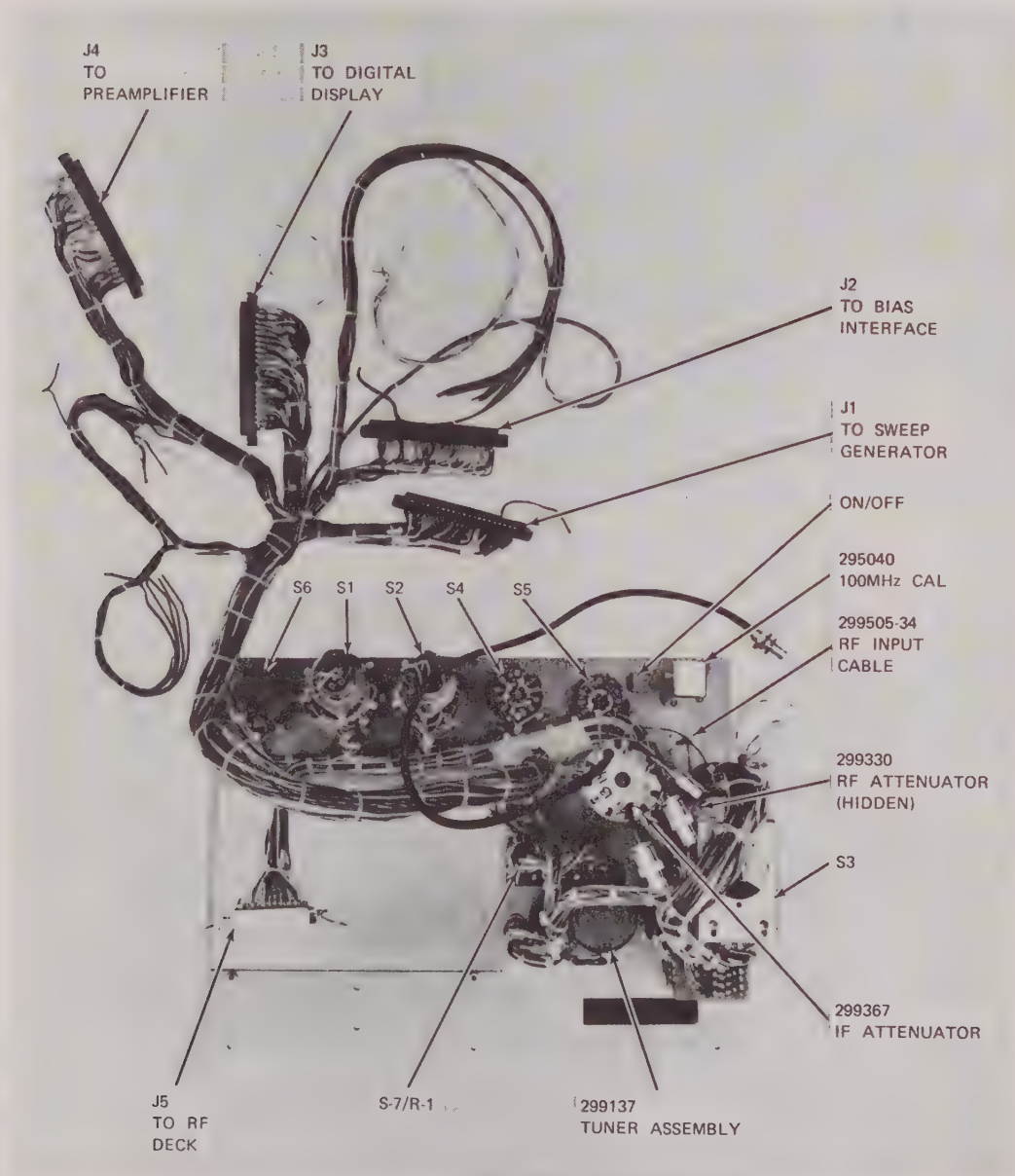


Figure 4-2. Front Panel and Harness Assembly

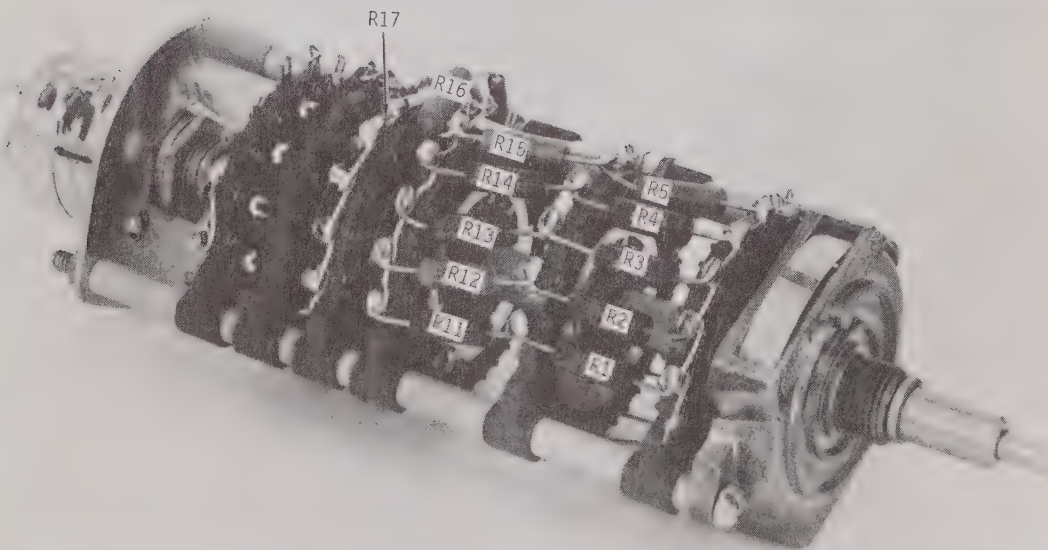
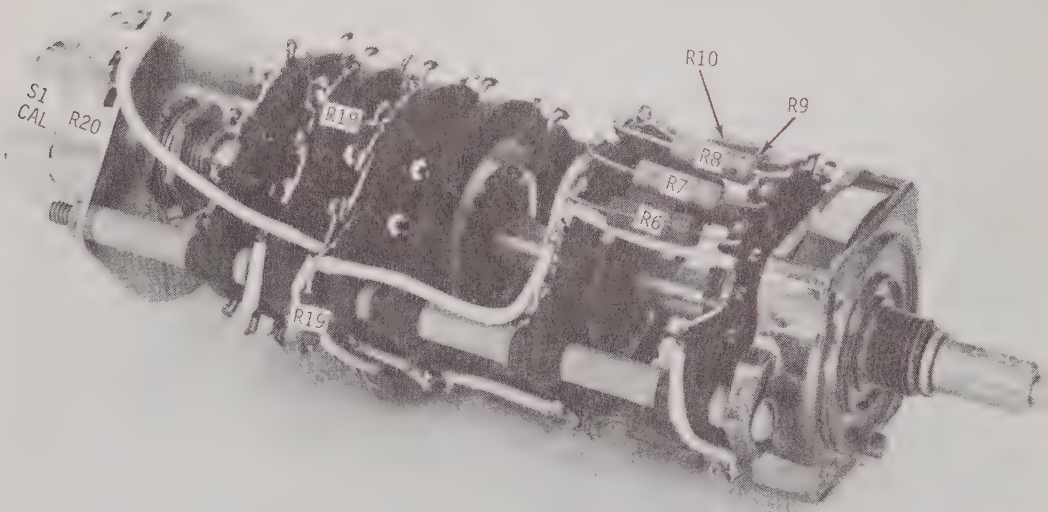


Figure 4-3. SCAN WIDTH Switch S1 (299475)

SCAN WIDTH SWITCH S1 (299475)

<u>Item</u>	<u>Description</u>	<u>FMC</u>	<u>Part No.</u>
R1, R2	Resistor, 100, 1/8 W	81349	RN60C1000F
R3, R4	Resistor, 1 k, 1/8 W	81349	RN60C1001F
R5	Resistor, 1 k, 1/8 W	81349	RN60C1001F
R6	Resistor, 143, 1/8 W	81349	RN60C1430F
R7	Resistor, 442, 1/8 W	81349	RN60C4420F
R8	Resistor, 1.65 k, 1/8 W	81349	RN60C1651F
R9	Resistor, 4.02 k, 1/8 W	81349	RN60C4021F
R10	Resistor, 24.9 k, 1/8 W	81349	RN60C2492F
R11	Resistor, 30.1 k, 1/8 W	81349	RN60C3012F
R12	Resistor, 10 k, 1/8 W	81349	RN60C1002F
R13	Resistor, 29.4 k, 1/8 W	81349	RN60C2942F
R14	Resistor, 9.09 k, 1/8 W	81349	RN60C9091F
R15, R16	Resistor, 2 k, 1/8 W	81349	RN60C2001F
R17	Resistor, 1 k, 1/8 W	81349	RN60C1001F
R18	Resistor, 100, 1/4 W	81349	RC07GF101J
R19	Resistor, 1 k, 1/4 W	81349	RC07GF102J

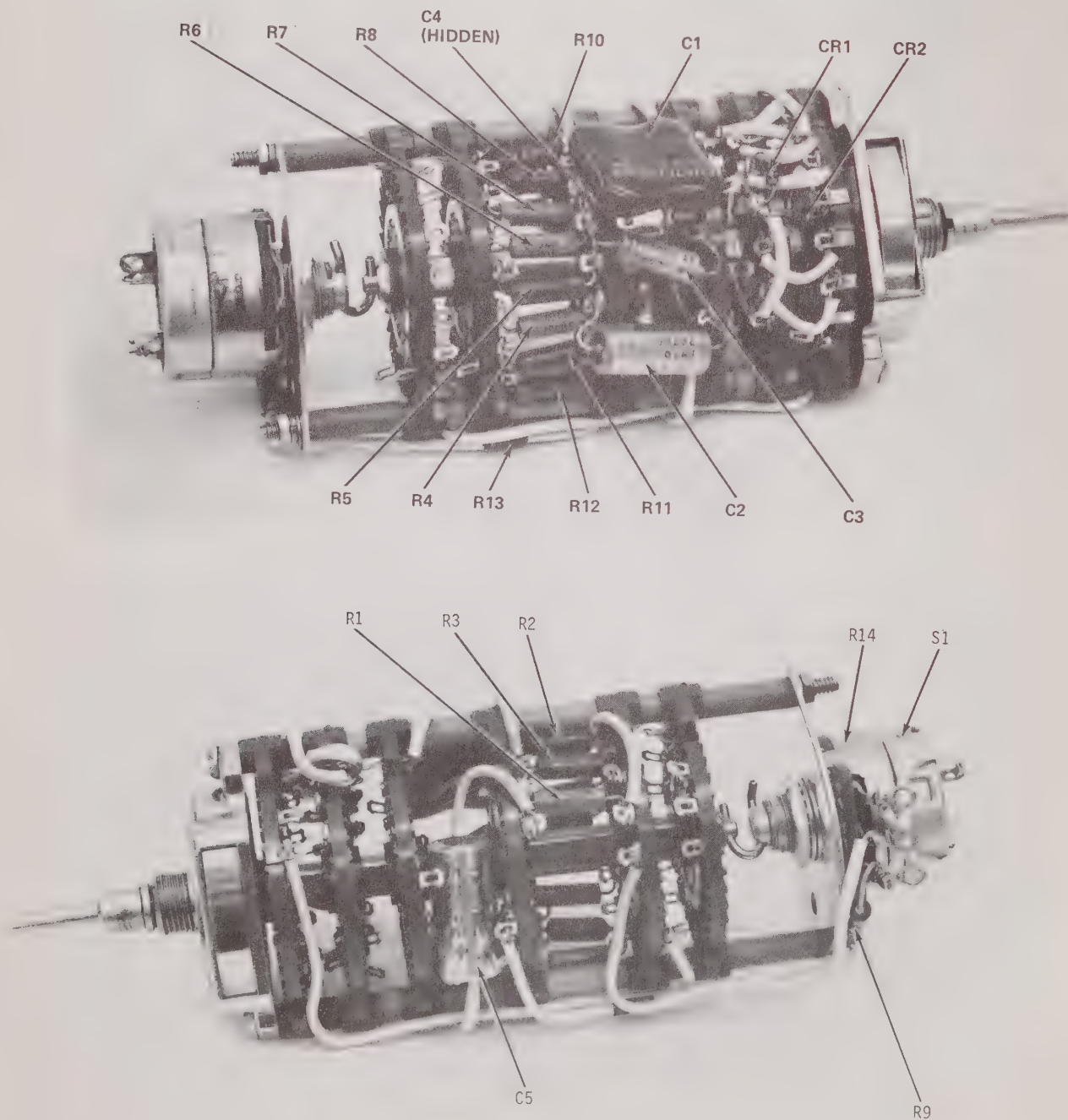


Figure 4-4. SCAN TIME Switch S2 (299476)

SCAN TIME SWITCH S2 (299476)

<u>Item</u>	<u>Description</u>	<u>FMC</u>	<u>Part No.</u>
C1	Capacitor, 0.01 μ F	81349	CM07FD103J03
C2	Capacitor, 100 μ F	81349	CS13BC107K
C3	Capacitor, 27 μ F	81349	CS13BC276K
C4	Capacitor, 3.3 μ F, 15 V	81349	M39003/01-5020
C5	Capacitor, 540 μ F	14655	TX65BE541KPE
CR1	Diode	03508	1N4009
CR2	Not used		
CR3	Diode	03508	1N4009
R1	Resistor, 464 k, 1/8 W, 1 Meg	81349	RN60D1004F
R2	Resistor, 95.3 k, 1/8 W	81349	RN60C9532F
R3	Resistor, 8.25 k, 1/8 W	81349	RN60C8251F
R4	Resistor, 90.9 k, 1/8 W	81349	RN60C9092F
R5	Resistor, 28 k, 1/8 W	81349	RN60C2802F
R6	Resistor, 37.4 k, 1/8 W	81349	RN60C3743F
R7	Resistor, 11.3 k, 1/8 W	81349	RN60C1132F
R8	Resistor, 29.4 k, 1/8 W	81349	RN60C2942F
R9	Resistor, 100 k, 1/2 W	81349	RC20GF104J
R10	Resistor, 9.09 k, 1/8 W	81349	RN60C9091F
R11	Resistor, 56.2 k, 1/8 W	81349	RN60C5622F
R12	Resistor, 187 k, 1/8 W	81349	RN60C1873F
R13	Resistor, 510, 1/4 W	81349	RC07GF511J
S1/R14	Resistor, variable, 20 k 3A, 125V	71450	WR5314

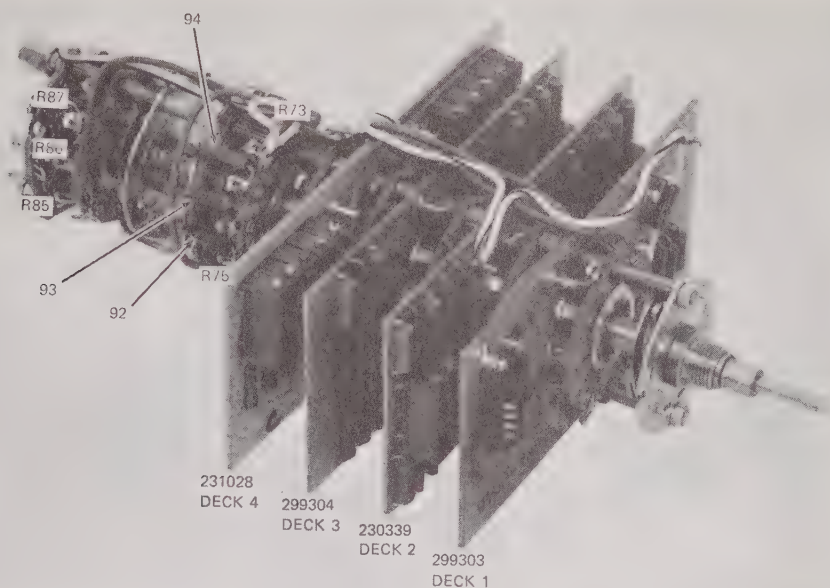


Figure 4-5. RF RANGE Switch S3 (299302)

RF RANGE (GHz) SWITCH S3 (299302)

<u>Item</u>	<u>Description</u>	<u>FMC</u>	<u>Part No.</u>
R73	Resistor, 5.49 k, 1%, 1/8 W	81349	RN60C5491F
R74	Resistor, 82 k, 1/4 W	81349	RC07GF823J
R75	Resistor, 120 k, 1/4 W	81349	RC07GF124J
R76 thru			
R84	Not used		
R85	Resistor, 10.0 k, 1%, 1/8 W	81349	RN60C1002F
R86	Resistor, 10.0 k, 1%, 1/8 W	81349	RN60C1002F
R87	Resistor, 1 k, 1/4 W	81349	RC07GF102J
R92	Resistor, 10.0 k, 1%, 1/8 W	81349	RN60C1002F
R93	Resistor, 4.99 k, 1%, 1/8 W	81349	RN60C4991F
R94	Resistor, 2.5 k, 1%, 1/8 W	81349	RN60C2501F
R95	Resistor, 4.7 k, 1/4 W	81349	RC07GF472J
R96	Resistor, 4.3 k, 1/4 W	81349	RC07GF432J
R97	Resistor, 4.7 k, 1/4 W	81349	RC07GF472J
Deck 1	YIG FM Tuning Drive Board	00752	2995016
Deck 2	YIG Offset Board	00752	230339
Deck 3	YIG Gains Board	00752	299304
Deck 4	Digital Display Board	00752	231028

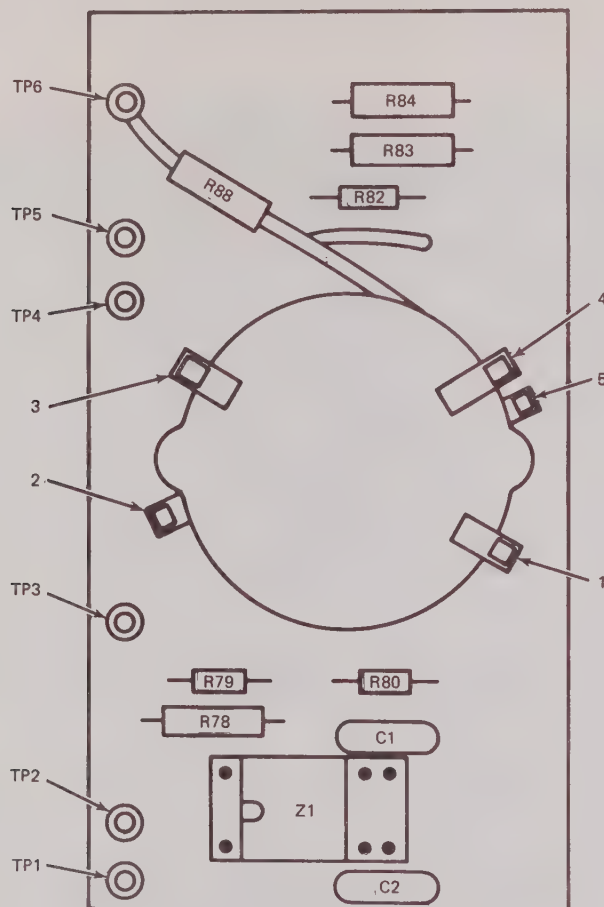


Figure 4-6. Switch S3 Deck 1--YIG FM Tuning Drive Board (299303)

SWITCH S3 DECK 1--YIG FM TUNING DRIVE BOARD (2995016)

<u>Item</u>	<u>Description</u>	<u>FMC</u>	<u>Part No.</u>
C1, C2	Capacitor, 0.01 μ F	56289	5HKS-S10
R79 thru R80	Resistor, 10 k, 1/8 W	81349	RN60C1002F
R81	Not used		
R82	Resistor, 2 k, 1/8 W	81349	RN60C2000F
R83	Resistor, 4.99 k, 1/8 W	81349	RN60C4991F
R84	Resistor, 2.49 k, 1/8 W	81349	RN60C2491F
R88	Resistor, 2 k, 1/8 W	81349	RN60C2000F
Z1	IC	01295	SN72741P

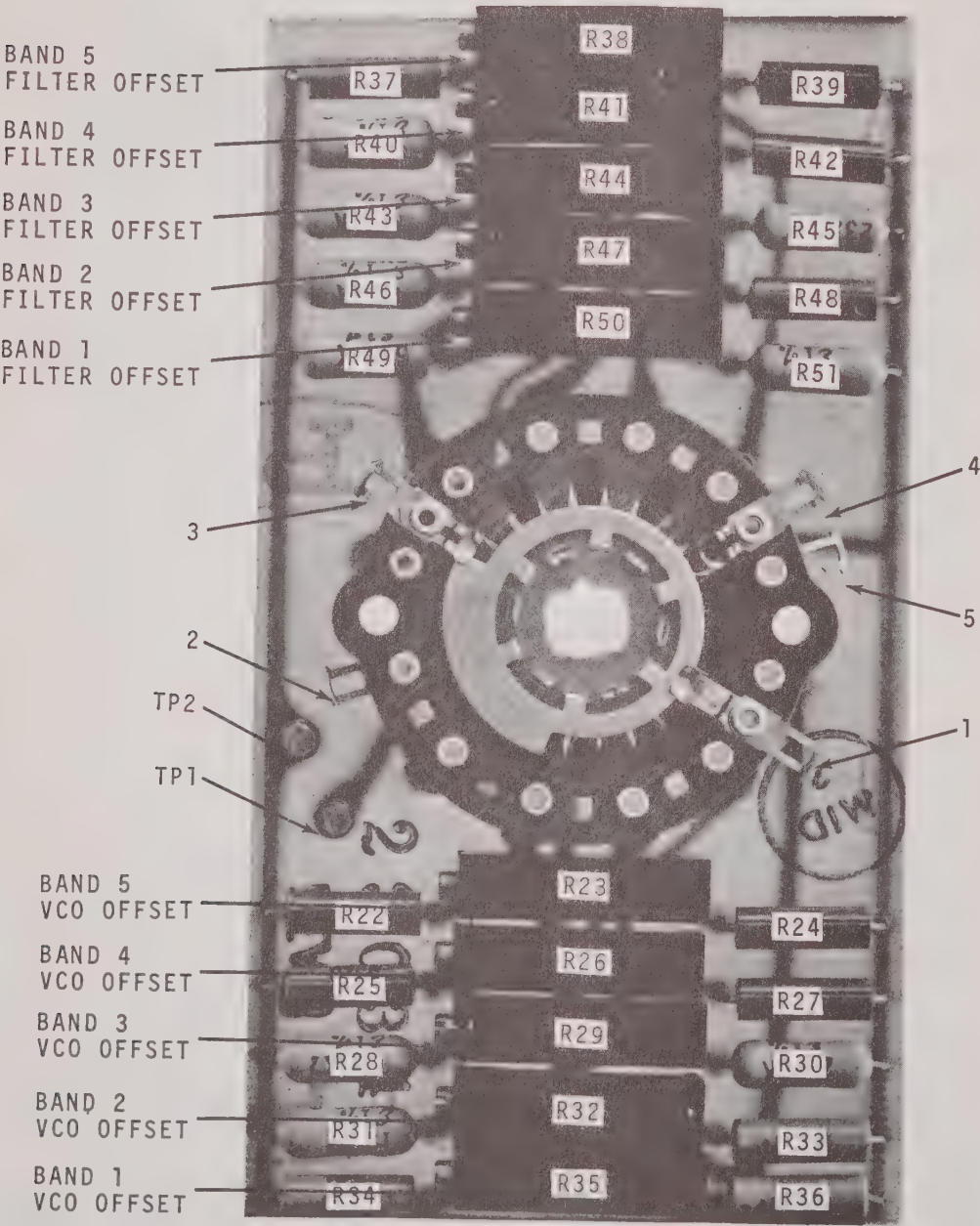


Figure 4-7. Switch S3 Deck 2--YIG Offset Board (230339)

SWITCH S3 DECK 2--YIG OFFSET BOARD (230339)

<u>Item</u>	<u>Description</u>	<u>FMC</u>	<u>Part No.</u>
R22	Resistor, 374, 1%, 1/8 W	81349	RN60C3740F
R23	Resistor, variable, 500	80294	3009P-1-501
R24	Resistor, 2.49 k, 1%, 1/8 W	81349	RN60C2491F
R25	Resistor, 374, 1%, 1/8 W	81349	RN60C3740F
R26	Resistor, variable, 500	80294	3009P-1-501
R27	Resistor, 2.49 k, 1%, 1/8 W	81349	RN60C2491F
R28	Resistor, 412, 1%, 1/8 W	81349	RN60C4120F
R29	Resistor, variable, 500	80294	3009P-1-501
R30	Resistor, 2.32 k, 1%, 1/8 W	81349	RN60C2321F
R31	Resistor, 130, 1%, 1/8 W	81349	RN60C1300F
R32	Resistor, variable, 500	80294	3009P-1-501
R33	Resistor, 2.61 k, 1%, 1/8 W	81349	RN60C2611F
R34	Resistor, 107, 1%, 1/8 W	81349	RN60C1070F
R35	Resistor, variable, 500	80294	3009P-1-501
R36	Resistor, 2.61 k, 1%, 1/8 W	81349	RN60C2611F
R37	Resistor, 681, 1%, 1/8 W	81349	RN60C6810F
R38	Resistor, variable, 500	80294	3009P-1-501
R39	Resistor, 3.01 k, 1%, 1/8 W	81349	RN60C3011F
R40	Resistor, 681, 1%, 1/8 W	81349	RN60C6810F
R41	Resistor, variable, 500	80294	3009P-1-501
R42	Resistor, 3.01 k, 1%, 1/8 W	81349	RN60C3011F
R43	Resistor, 1.82 k, 1%, 1/8 W	81349	RN60C1821F
R44	Resistor, variable, 500	80294	3009P-1-501
R45	Resistor, 2.32 k, 1%, 1/8 W	81349	RN60C2321F
R46	Resistor, 4.75 k, 1%, 1/8 W	81349	RN60C4751F
R47	Resistor, variable, 500	80294	3009P-1-501
R48	Resistor, 1.96 k, 1%, 1/8 W	81349	RN60C1961F
R49	Resistor, 6.81 k, 1%, 1/8 W	81349	RN60C6811F
R50	Resistor, variable, 500	80294	3009P-1-501
R51	Resistor, 1.96 k, 1%, 1/8 W	81349	RN60C1961F

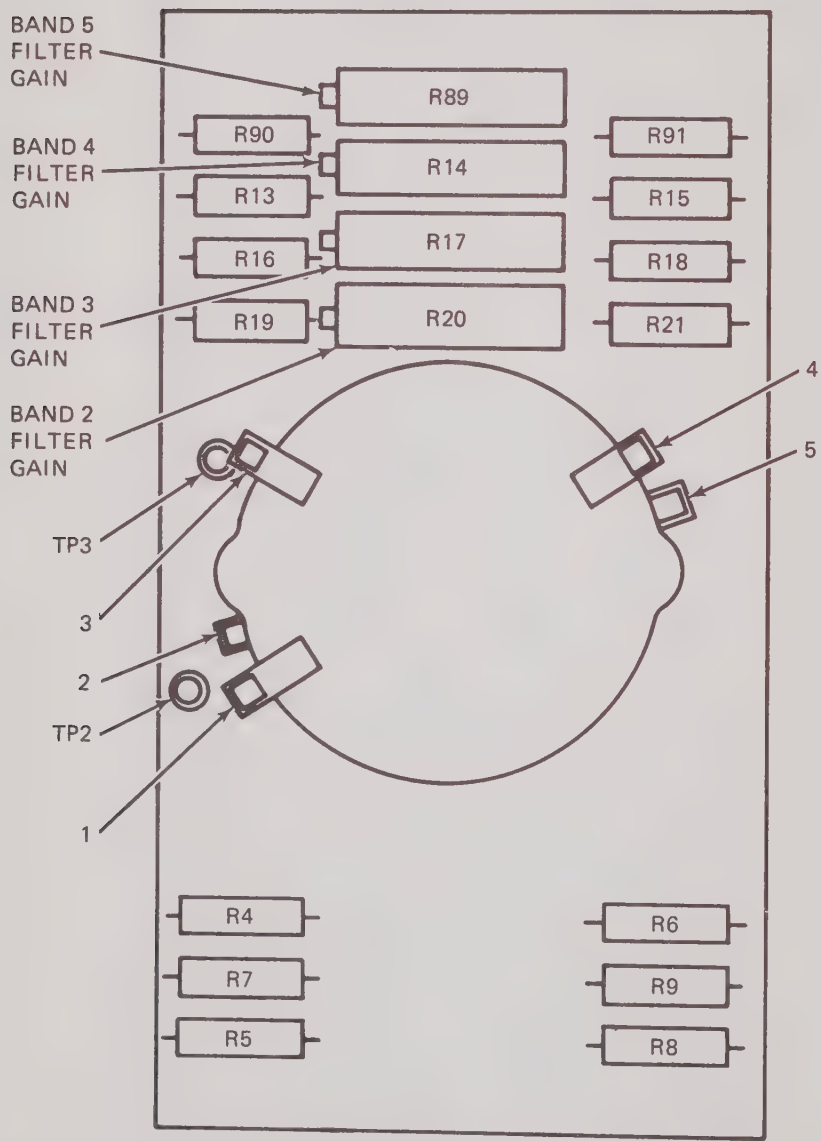


Figure 4-8. Switch S3 Deck 3--YIG Gains Board (299304)

SWITCH S3 DECK 3--YIG GAINS BOARD (299304)

<u>Item</u>	<u>Description</u>	<u>FMC</u>	<u>Part No.</u>
R1 thru	Not used		
R3	Not used		
R4, R5	Resistor, 2 k, 1%, 1/8 W	81349	RN60C2001F
R6 thru			
R9	Resistor, 1 k, 1%, 1/8 W	81349	RN60C1001F
R10 thru	Not used		
R12	Not used		
R13	Resistor, 3.01 k, 1%, 1/8 W	81349	RN60C3011F
R14	Resistor, variable, 500	80294	3009P-1-501
R15	Resistor, 1.78 k, 1%, 1/8 W	81349	RN60C1781F
R16	Resistor, 3.01 k, 1%, 1/8 W	81349	RN60C3011F
R17	Resistor, variable, 500	80294	3009P-1-501
R18	Resistor, 1.78 k, 1%, 1/8 W	81349	RN60C1781F
R19	Resistor, 30.1 k, 1%, 1/8 W	81349	RN60C3011F
R20	Resistor, variable, 500	80294	3009P-1-501
R21	Resistor, 1.78 k, 1%, 1/8 W	81349	RN60C1781F
R89	Resistor, variable, 500	80294	3009P-1-501
R90	Resistor, 3.01 k, 1%, 1/8 W	81349	RN60C3011F
R91	Resistor, 1.78 k, 1%, 1/8 W	81349	RN60C1781F

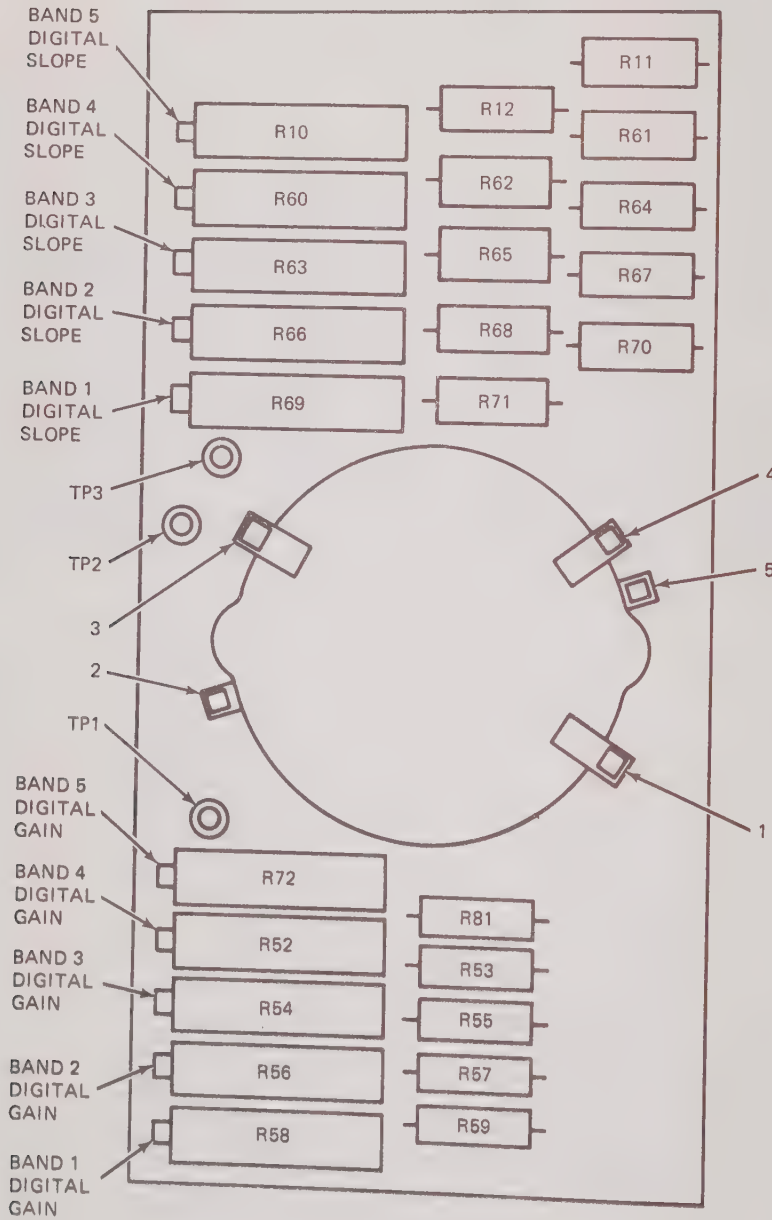


Figure 4-9. Switch S3 Deck 4--Digital Display Board (231028)

SWITCH S3 DECK 4--DIGITAL DISPLAY BOARD (231028)

<u>Item</u>	<u>Description</u>	<u>FMC</u>	<u>Part No.</u>
R10	Resistor, variable, 500	80294	3009P-1-501
R11	Resistor, 178 k, 1%, 1/8 W	81349	RN60C1783F
R12	Resistor, 3.65 k, 1%, 1/8 W	81349	RN60C3650F
R52	Resistor, variable, 2 k	80294	3009P-1-202
R53	Resistor, 5.11 k, 1%, 1/8 W	81349	RN60C5111F
R54	Resistor, variable, 5 k	80294	3009P-1-502
R55	Resistor, 9.31 k, 1%, 1/8 W	81349	RN60C9311F
R56	Resistor, variable, 10 k	80294	3009P-1-103
R57	Resistor, 7.5 k, 1%, 1/8 W	81349	RN60C7501F
R58	Resistor, variable, 10 k	80294	3009P-1-103
R59	Resistor, 22.1 k, 1%, 1/8 W	81349	RN60C2212F
R60	Resistor, variable, 500	80294	3009P-1-501
R61	Resistor, 113 k, 1%, 1/8 W	81349	RN60C1133F
R62	Resistor, 3.65 k, 1%, 1/8 W	81349	RN60C3651F
R63	Resistor, variable, 500	80294	3009P-1-501
R64	Resistor, 75 k, 1%, 1/8 W	81349	RN60C7502F
R65	Resistor, 3.65 k, 1%, 1/8 W	81349	RN60C3651F
R66	Resistor, variable, 500	80294	3009P-1-501
R67	Resistor, 53.6 k, 1%, 1/8 W	81349	RN60C5362F
R68	Resistor, 3.65 k, 1%, 1/8 W	81349	RN60C3651F
R69	Resistor, variable, 500	80294	3009P-1-501
R70	Resistor, 31.6 k, 1%, 1/8 W	81349	RN60C3162F
R71	Resistor, 3.65 k, 1%, 1/8 W	81349	RN60C3651F
R72	Resistor, variable	80294	3009P-1-202
R81	Resistor, 2.87 k, 1%, 1/8 W	81349	RN60C7871F

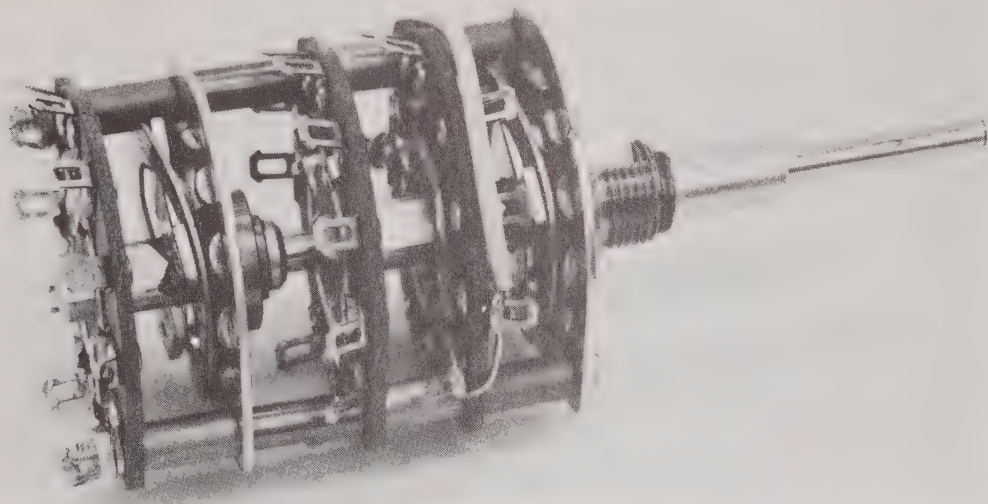


Figure 4-10. BANDWIDTH (kHz) Switch S4 (299477)

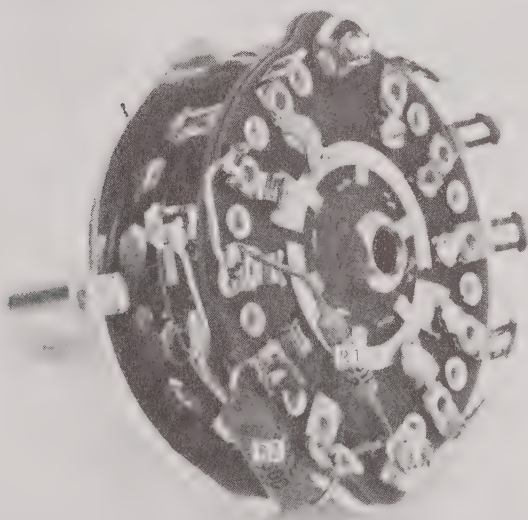


Figure 4-11. AMPLITUDE RANGE Switch S5 (299478)

<u>Item</u>	<u>Description</u>	<u>FMC</u>	<u>Part No.</u>
R1	Resistor, 45.3, 1/8 W	81349	RN60C45R3
R2	Resistor, 221, 1/8 W	81349	RN60C2210F

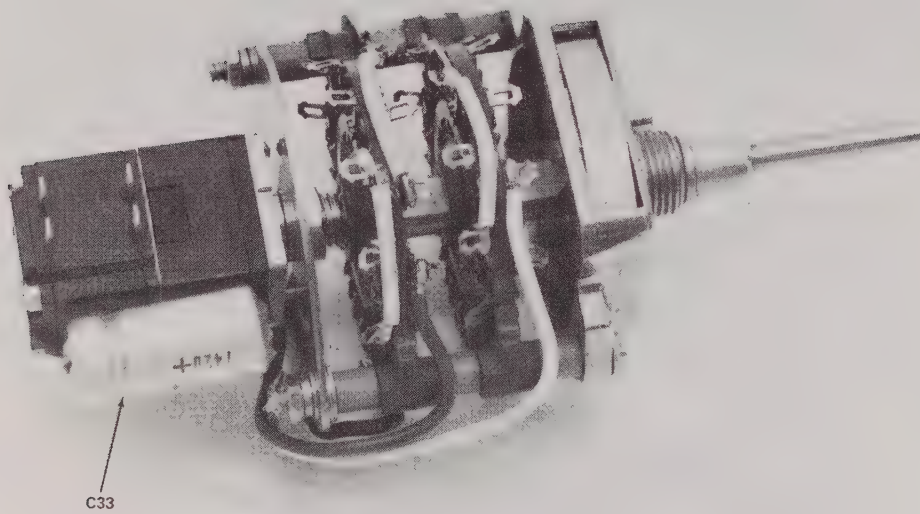


Figure 4-12. SCAN MODE Switch S6 (299479)

<u>Item</u>	<u>Description</u>	<u>FMC</u>	<u>Part No.</u>
C33	Capacitor, 430 μ F, +8 V	25289	109D437X008T2

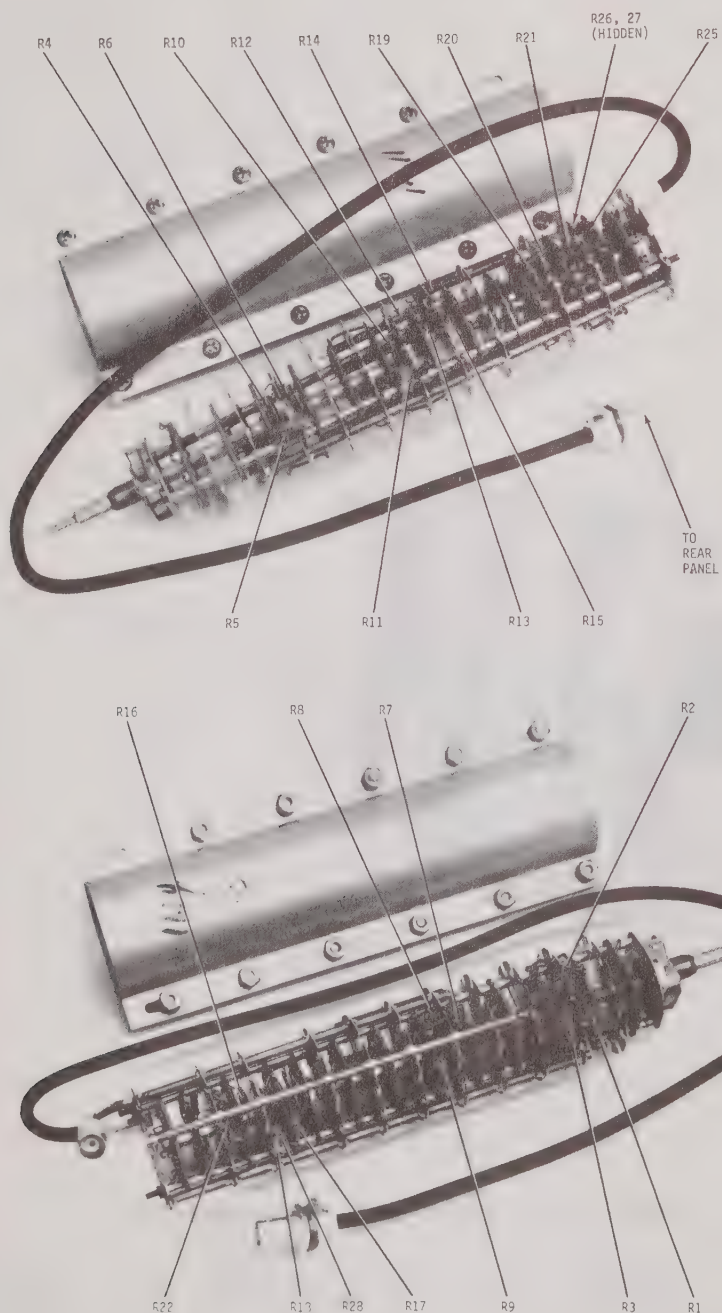


Figure 4-13. IF Attenuator Assembly (299367) (Sheet 1 of 2)

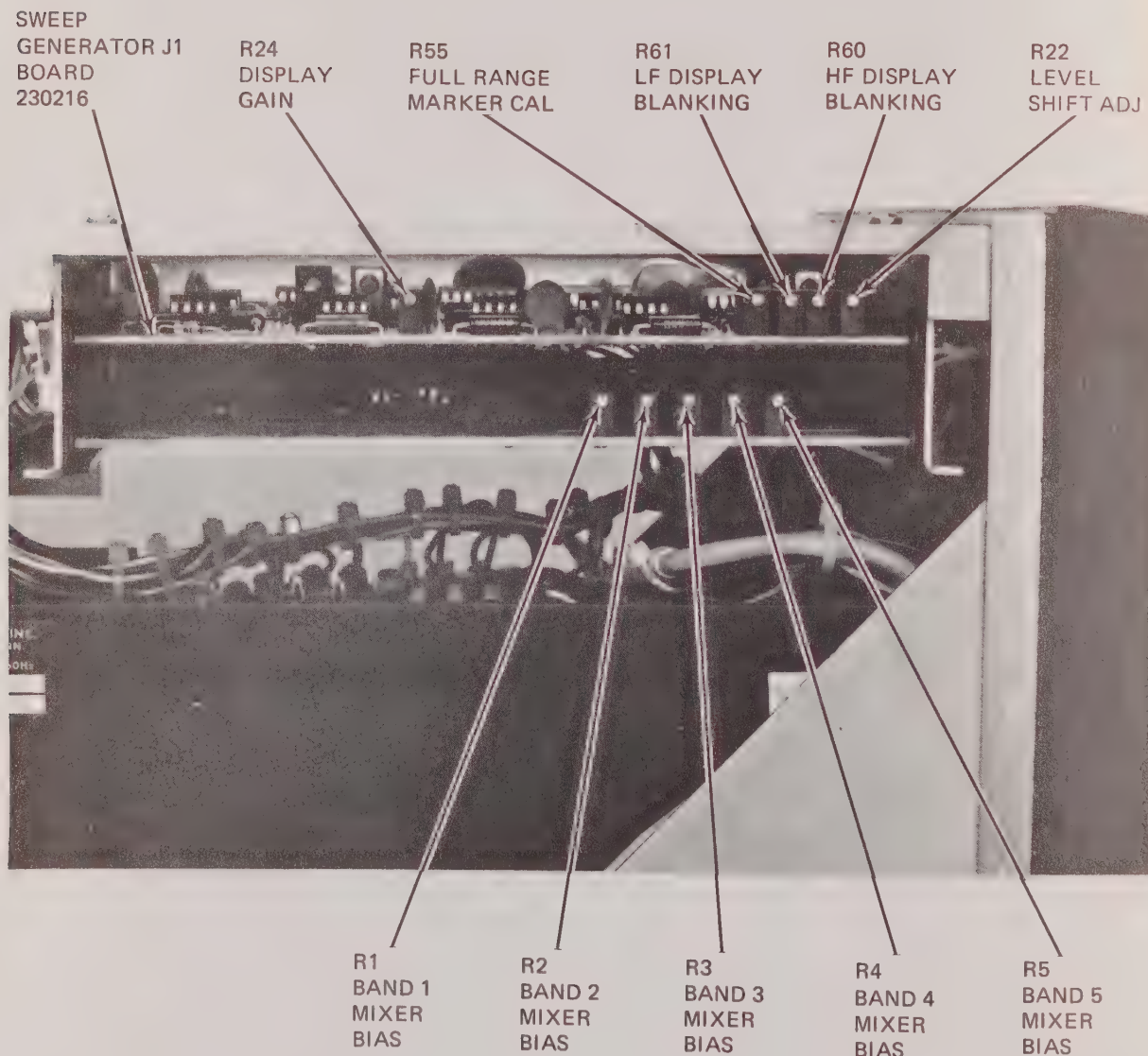
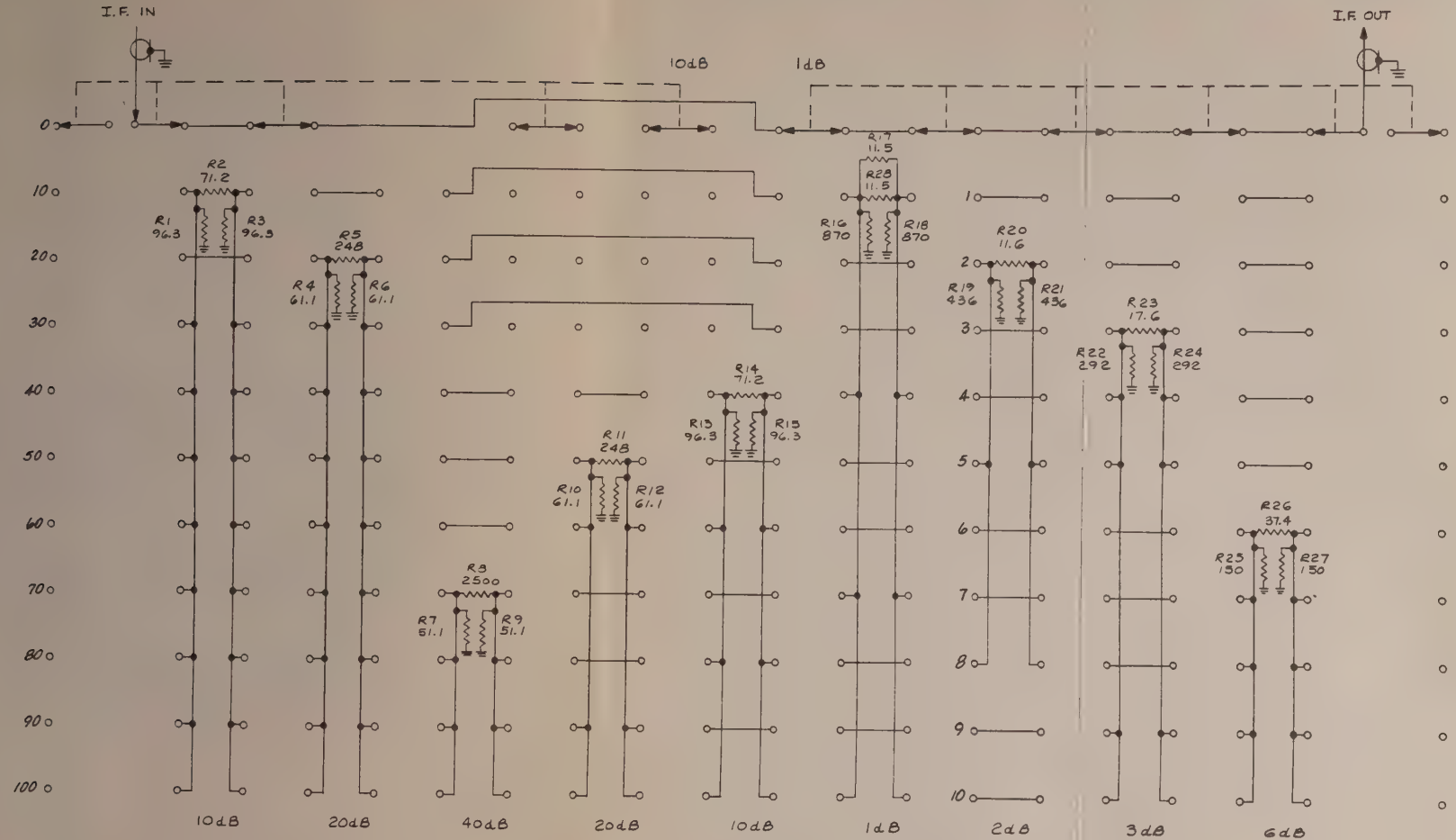


Figure 3-12. Sweep Generator J1 Board
(230216) Adjustment Locations
Bias Interface J2 Board
(299344) Adjustment Locations



NOTE:

1-ALL RESISTORS ARE RNGOC, 1/2% TOL.

Figure 4-13. IF Attenuator Assembly
(299367) (Sheet 2 of 2)

IF ATTENUATOR ASSEMBLY (299367)

<u>Item</u>	<u>Description</u>	<u>FMC</u>	<u>Part No.</u>
R1	Resistor, 96.3, 1/2%, 1/8 W	81349	RN60C96R3D
R2	Resistor, 71.2, 1/2%, 1/8 W	81349	RN60C71R2D
R3	Resistor, 96.3, 1/2%, 1/8 W	81349	RN60C96R3D
R4	Resistor, 61.1, 1/2%, 1/8 W	81349	RN60C61R1D
R5	Resistor, 248, 1/2%, 1/8 W	81349	RN60C2480D
R6	Resistor, 61.1, 1/2%, 1/8 W	81349	RN60C61R1D
R7	Resistor, 51.1, 1/2%, 1/8 W	81349	RN60C51R1D
R8	Resistor, 2500, 1/2%, 1/8 W	81349	RN60C2501D
R9	Resistor, 51.1, 1/2%, 1/8 W	81349	RN60C51R1D
R10	Resistor, 61.1, 1/2%, 1/8 W	81349	RN60C61R1D
R11	Resistor, 248, 1/2%, 1/8 W	81349	RN60C2480D
R12	Resistor, 61.1, 1/2%, 1/8 W	81349	RN60C61R1D
R13	Resistor, 96.3, 1/2%, 1/8 W	81349	RN60C96R3D
R14	Resistor, 71.2, 1/2%, 1/8 W	81349	RN60C71R2D
R15	Resistor, 96.3, 1/2%, 1/8 W	81349	RN60C96R3D
R16	Resistor, 870, 1/2%, 1/8 W	81349	RN60C8700D
R17	Resistor, 11.5, 1/2%, 1/8 W	81349	RN60C11R5D
R18	Resistor, 870, 1/2%, 1/8 W	81349	RN60C8700D
R19	Resistor, 436, 1/2%, 1/8 W	81349	RN60C4360D
R20	Resistor, 11.6, 1/2%, 1/8 W	81349	RN60C11R6D
R21	Resistor, 436, 1/2%, 1/8 W	81349	RN60C4360D
R22	Resistor, 292, 1/2%, 1/8 W	81349	RN60C2920D
R23	Resistor, 17.6, 1/2%, 1/8 W	81349	RN60C17R6D
R24	Resistor, 292, 1/2%, 1/8 W	81349	RN60C2920D
R25	Resistor, 150, 1/2%, 1/8 W	81349	RN60C1500D
R26	Resistor, 37.4, 1/2%, 1/8 W	81349	RN60C37R4D
R27	Resistor, 150, 1/2%, 1/8 W	81349	RN60C1500D
R28	Resistor, 11.5, 1/2%, 1/8 W	81349	RN60C11R5D

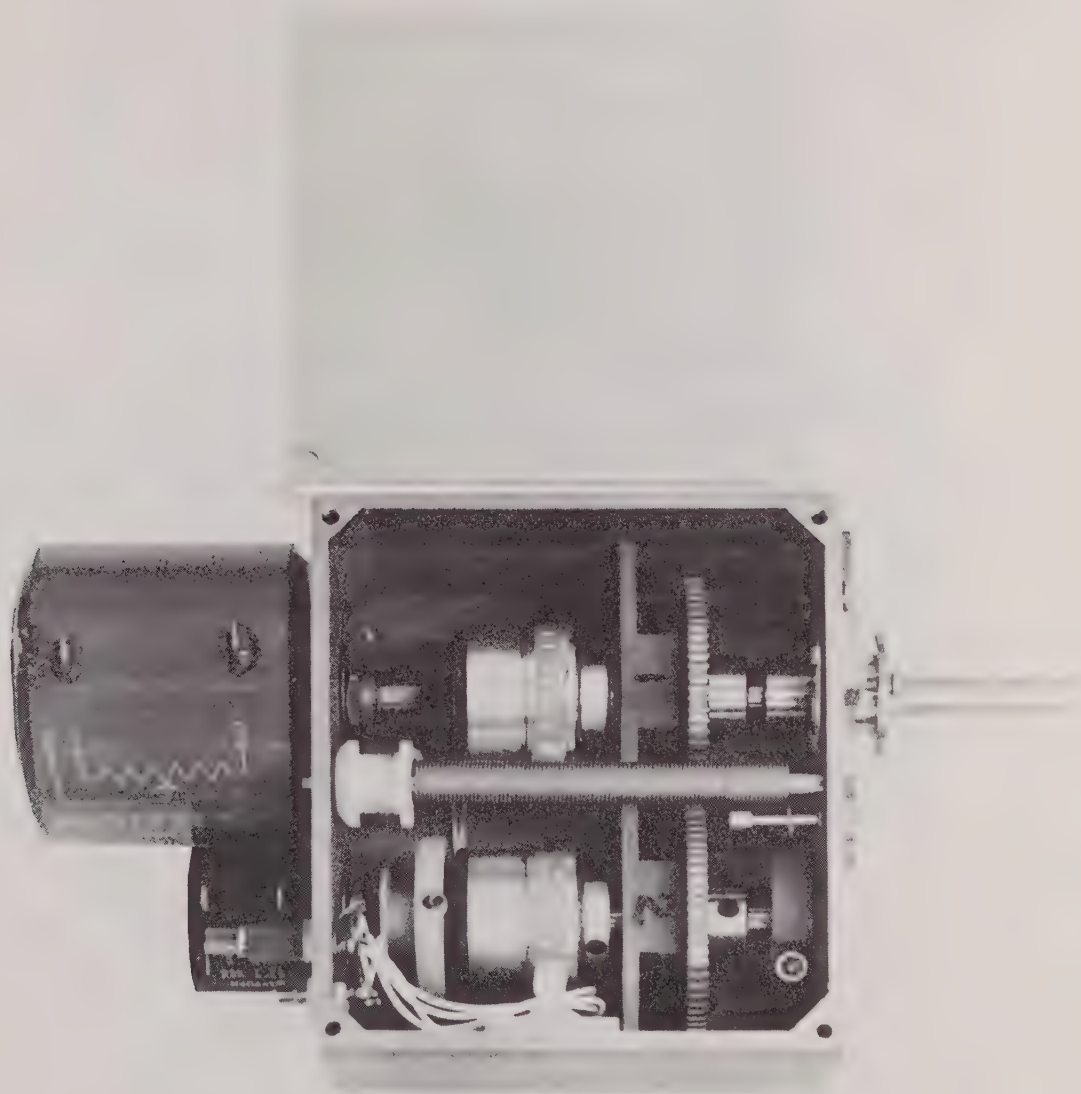


Figure 4-14. Tuner Assembly (299137)

TUNER ASSEMBLY (299137)

<u>Item</u>	<u>Description</u>	<u>FMC</u>	<u>Part No.</u>
C1	Capacitor, 430 μ F	56289	109D437X0008T2
C2, C3	Capacitor, 100 μ F, 25 V	56289	TE-1211
C4	Capacitor, 430 μ F	56289	109D437X0008T2
CR1, CR2	Diode	81349	1N4009
R1	Resistor, variable	80294	3400S-1-502
R2	Resistor, variable	05725	8136-SK
R3	Not used		
R4, R5	Resistor, 56, 0.5 W	81349	RC20GF560J
R6	Resistor, 5.1 k, 1/4 W	81349	RC07GF512J
	Clutch	05420	FG08-04-04-5-014
	Nylon, 12 lb test, 0.13 dia	---	---

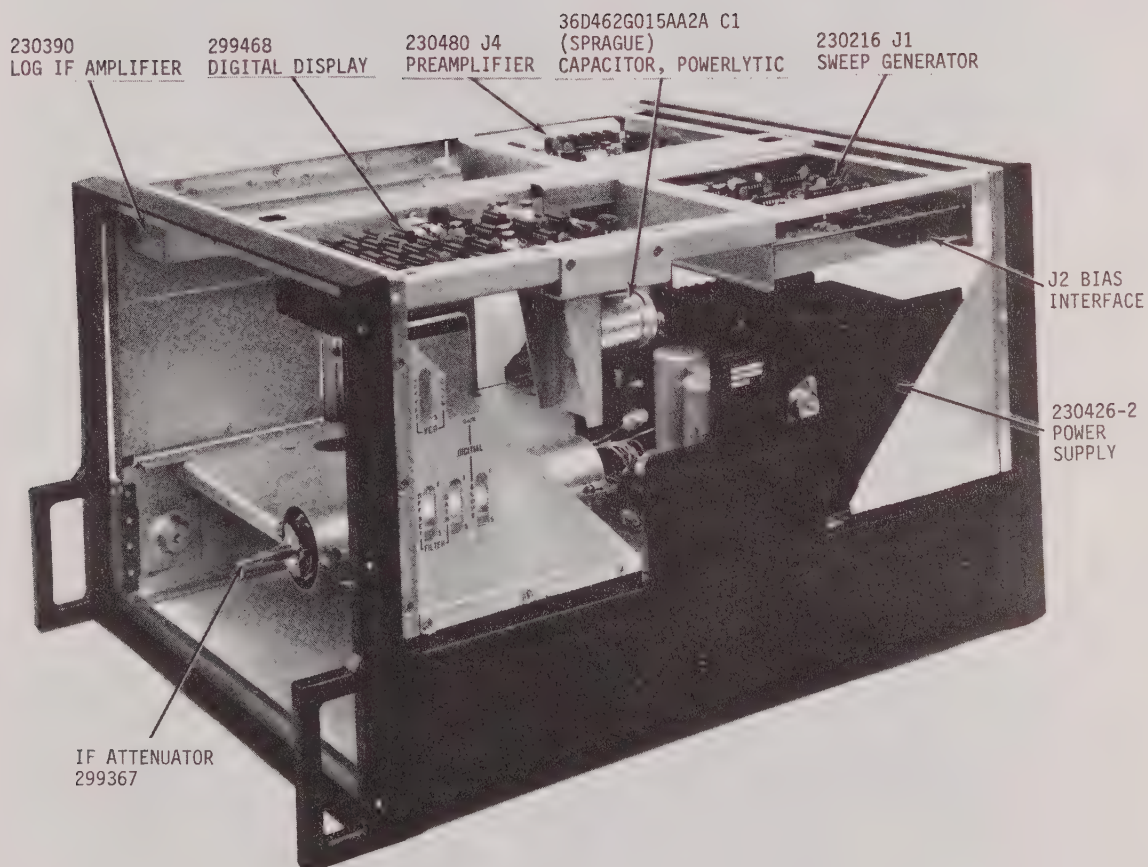


Figure 4-15. Main Frame Assembly

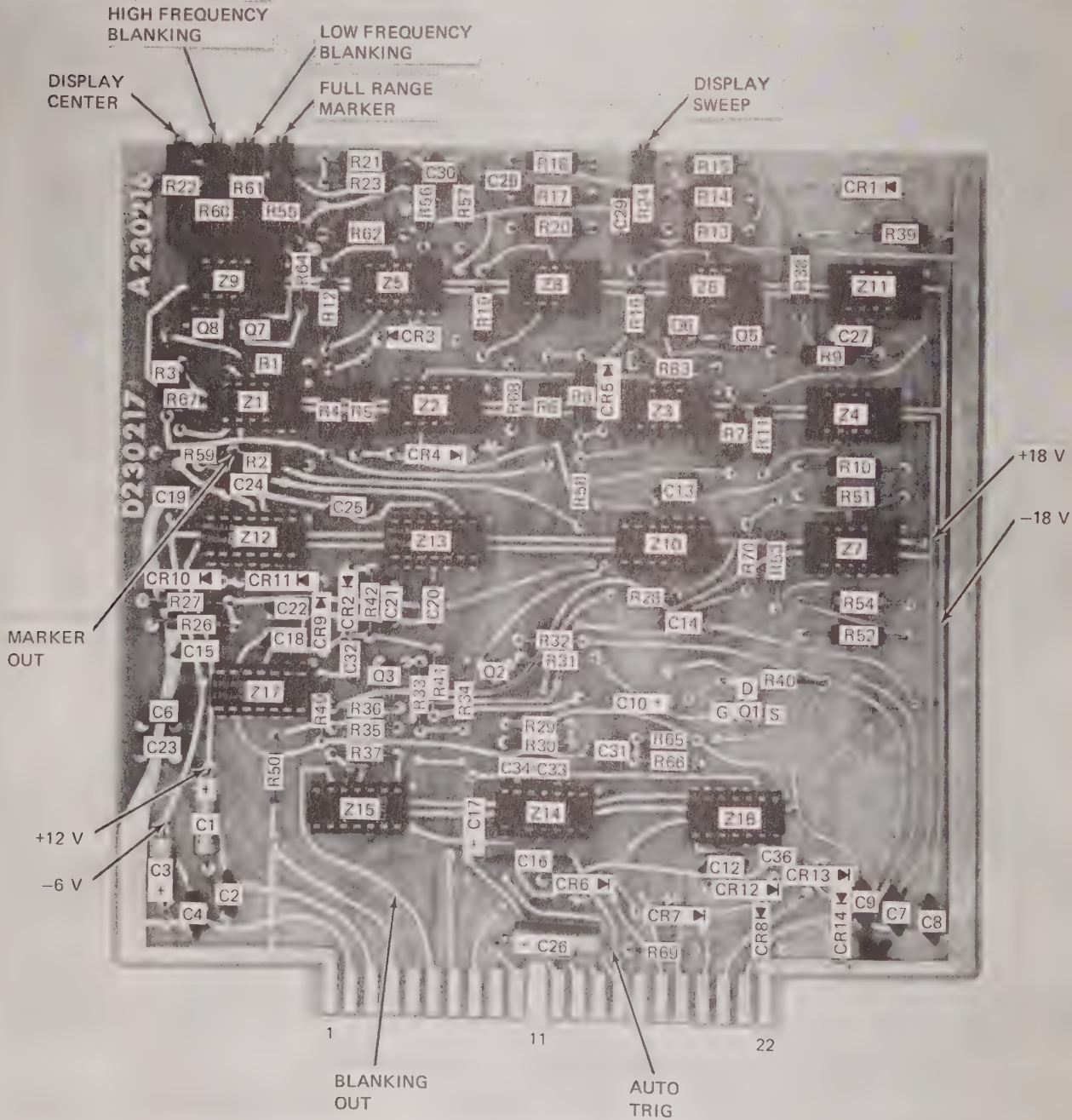
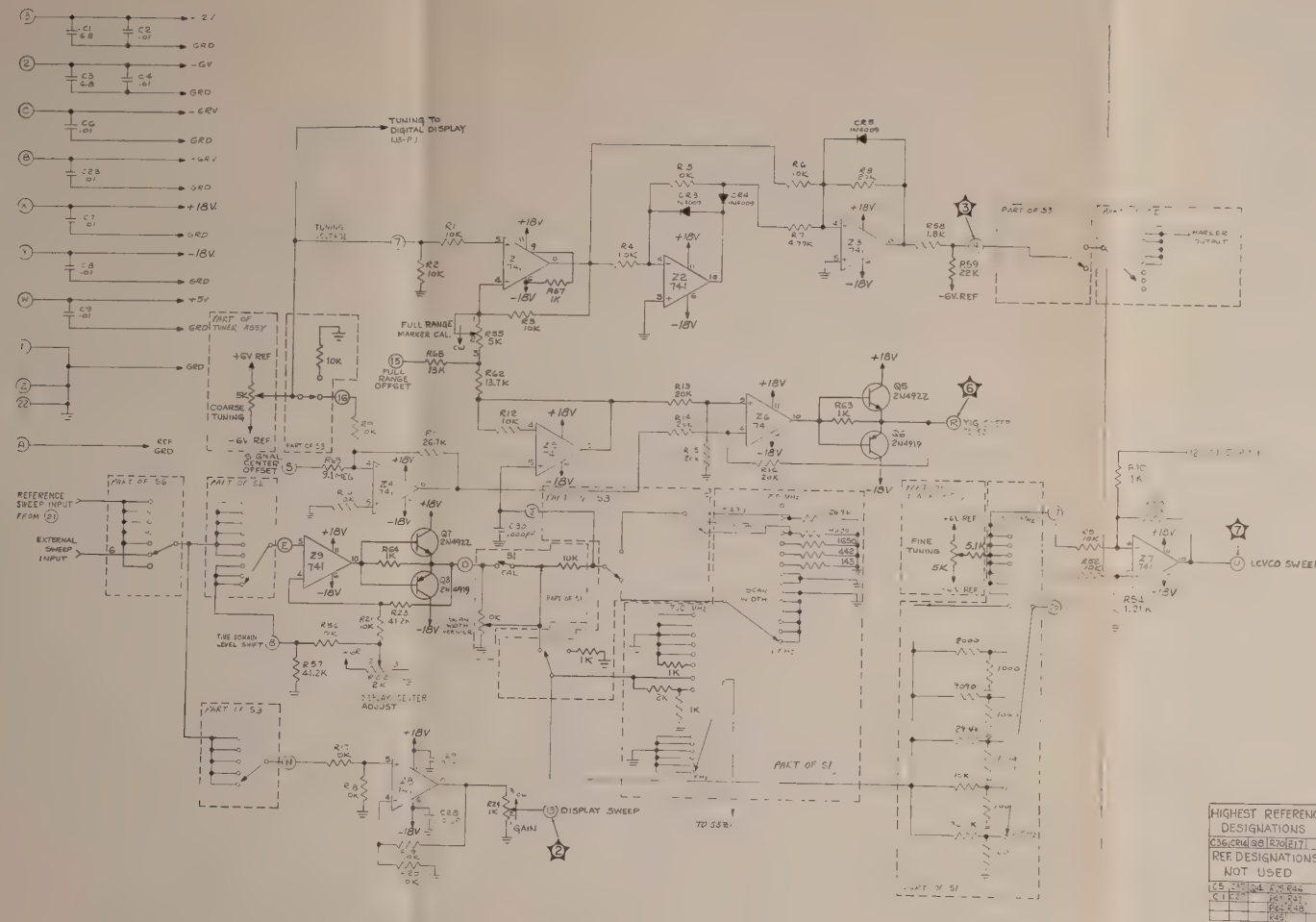
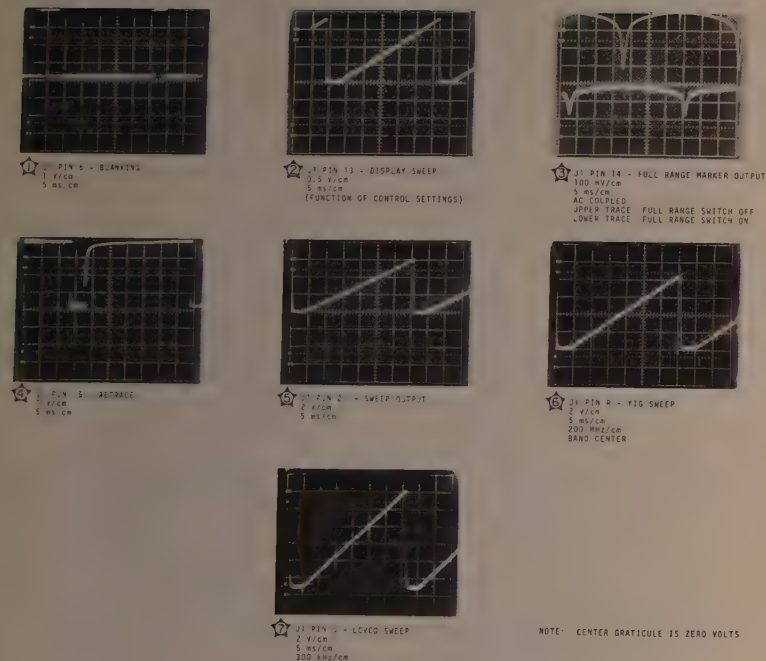


Figure 4-16. Sweep Generator J1 Board (230216) (Sheet 1 of 2)



HIGHEST REFERENCE	
DESIGNATIONS	
C36,C44,98	R70,Z17
REF. DESIGNATIONS	
NOT USED	
C5	C11
C12	C13
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SWEEP GENERATOR J1 BOARD (230216)

<u>Item</u>	<u>Description</u>	<u>FMC</u>	<u>Part No.</u>
C1	Capacitor, 6.8 μ F	81349	CS13BF685M
C2	Capacitor, .01 μ F	56289	5HKS-S10
C3	Capacitor, 6.8 μ F	81349	CS13BF685M
C4	Capacitor, .01 μ F	56289	5HKS-S10
C5	Not used		
C6 thru C9	Capacitor, 0.01 μ F	56289	5HKS-S10
C10	Capacitor, 3.3 μ F	81349	CS13BD335K
C11	Not used		
C12 thru C15	Capacitor, 0.01 μ F	56289	5HKS-S10
C16	Capacitor, 0.1 μ F, 75 V	71590	DDA-104
C17	Capacitor, 3.3 μ F	81349	CS13BD335K
C18 thru C25	Capacitor, 0.01 μ F	56289	5HKS-S10
C26	Capacitor, 100 μ F	56289	CS13BC107K
C27	Capacitor, 0.01 μ F	81349	CK05BX103K
C28, C29	Capacitor, 0.01 μ F	56289	5HKS-S10
C30	Capacitor, 1000 pf	71590	DD-102G
C31	Capacitor, 0.01 μ F	56289	5HKS-S10
C32	Capacitor, 1000 pf	71590	DD-102G
C33, C34	Capacitor, 0.1 μ F	00752	299245-1
C35	Not used		
C36	Capacitor, 0.1 μ F	00752	299245-1
CR1	Diode	03508	1N4009
CR2	Diode	03508	1N645
CR3 thru CR14	Diode	03508	1N4009
Q1	Transistor	04713	2N4392
Q2	Transistor	04713	2N4124
Q3	Transistor	49956	2N4126
Q4	Not used		
Q5	Transistor	49956	2N4922
Q6	Transistor	04713	2N4919
Q7	Transistor	49956	2N4922
Q8	Transistor	04713	2N4919
R1 thru R6	Resistor, 10 k, 1/8 W	81349	RN60C1002F
R7	Resistor, 4.99 k, 1/8 W	81349	RN60C4991F
R8	Resistor, 20 k, 1/8 W	81349	RN60C2002F
R9, R10	Resistor, 10 k, 1/8 W	81349	RN60C1002F
R11	Resistor, 26.7 k, 1/8 W	81349	RN60C2672F
R12	Resistor, 10 k, 1/8 W	81349	RN60C1002F
R13 thru R16	Resistor, 20 k, 1/8 W	81349	RN60C2002F
R17 thru R21	Resistor, 10 k, 1/8 W	81349	RN60C1002F
R22	Resistor, variable, 2 k	80294	3009P-1-202
R23	Resistor, 41.2 k, 1/8 W	81349	RN60C4122F
R24	Resistor, variable, 1 k	80294	3009P-1-102
R25	Not used		
R26, R27	Resistor, 1 k, 1/8 W	81349	RN60C1001F

SWEEP GENERATOR J1 BOARD (230216) (cont)

<u>Item</u>	<u>Description</u>	<u>FMC</u>	<u>Part No.</u>
R28	Resistor, 100 k, 1/4 W	81349	RC07GF104J
R29	Resistor, 3.9 k, 1/4 W	81349	RC07GF392J
R30	Resistor, 4.7 k, 1/4 W	81349	RC07GF472J
R31, R32	Resistor, 100 k, 1/4 W	81349	RC07GF104J
R33	Resistor, 10 k, 1/4 W	81349	RC07GF103J
R34	Resistor, 4.7 k, 1/4 W	81349	RC07GF472J
R35	Resistor, 3 k, 1/4 W	81349	RC07GF302J
R36	Resistor, 16 k, 1/4 W	81349	RC07GF163J
R37	Resistor, 4.7 k, 1/4 W	81349	RC07GF472J
R38, R39	Resistor, 1 k, 1/8 W	81349	RN60C1001F
R40	Resistor, 4.7 k, 1/4 W	81349	RC07GF472J
R41	Resistor, 510, 1/4 W	81349	RC07GF511J
R42	Resistor, 5.1 k, 1/4 W	81349	RC07GF512J
R43 thru R48	Not used		
R49	Resistor, 33 k, 1/4 W	81349	RC07GF333J
R50	Resistor, 200, 1/4 W	81349	RC07GF201J
R51, R52	Resistor, 10 k, 1/8 W	81349	RN60C1002F
R53	Resistor, 20 k, 1/8 W	81349	RN60C2002F
R54	Resistor, 1.21 k, 1/8 W	81349	RN60C1211F
R55	Resistor, variable, 5 k	80294	3009P-1-502
R56	Resistor, 10 k, 1/8 W	81349	RN60C1002F
R57	Resistor, 41.2 k, 1/8 W	81349	RN60C4122F
R58	Resistor, 4.3 k, 1/4 W	81349	RC07GF432J
R59	Resistor, 7.5 k, 1/4 W	81349	RC07GF752J
R60, R61	Resistor, variable, 10 k	80294	3009P-1-103
R62	Resistor, 13.7 k, 1/8 W	81349	RN60C1372F
R63, R64	Resistor, 1 k, 1/4 W	81349	RC07GF102J
R65, R66	Resistor, 3.9 k, 1/4 W	81349	RC07GF392J
R67	Resistor, 1 k, 1/4 W	81349	RC07GF102J
R68	Resistor, 13 k, 1/4 W	81349	RC07GF133J
R69	Resistor, 9.1 Meg, 1/4 W	81349	RC07GF915J
R70	Resistor, 1 k, 1/4W	81349	RC07GF102J
Z1 thru Z9	IC	01295	SN72741P
Z10	IC	01295	SN72710N
Z11	IC	01295	SN72741P
Z12, Z13	IC	01295	SN72710N
Z14 thru Z16	IC	01295	SN7400N
Z17	IC	01295	SN72710N

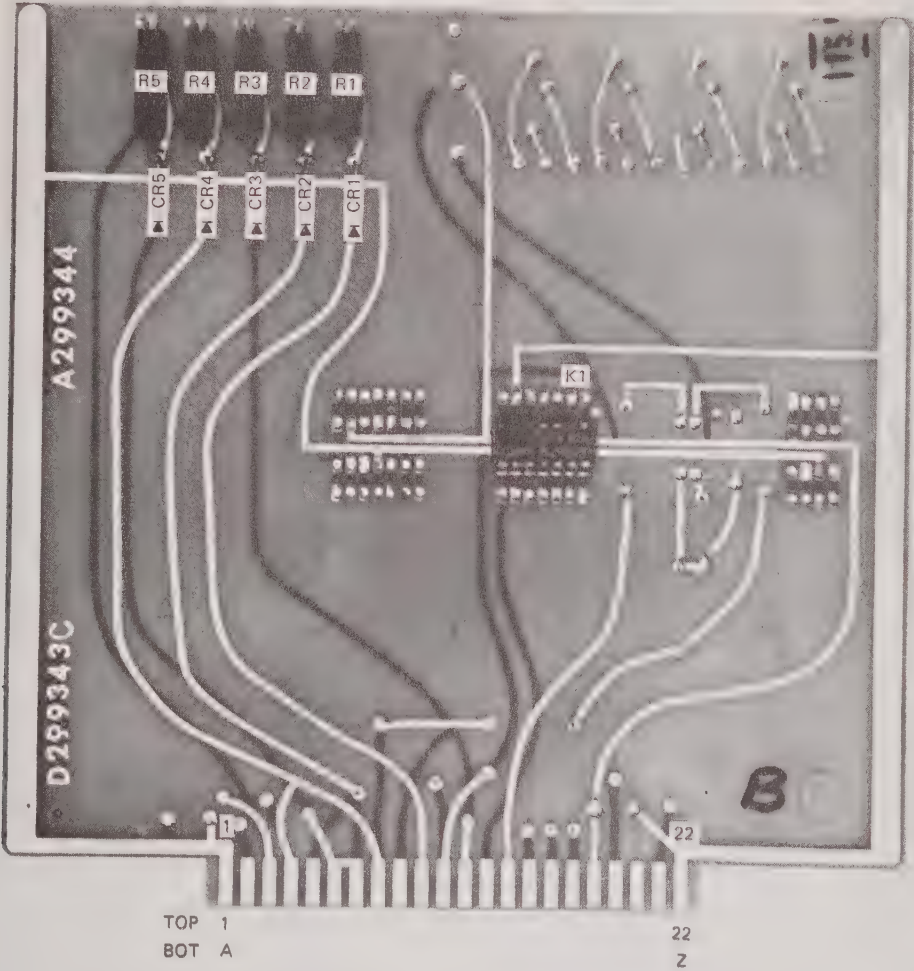
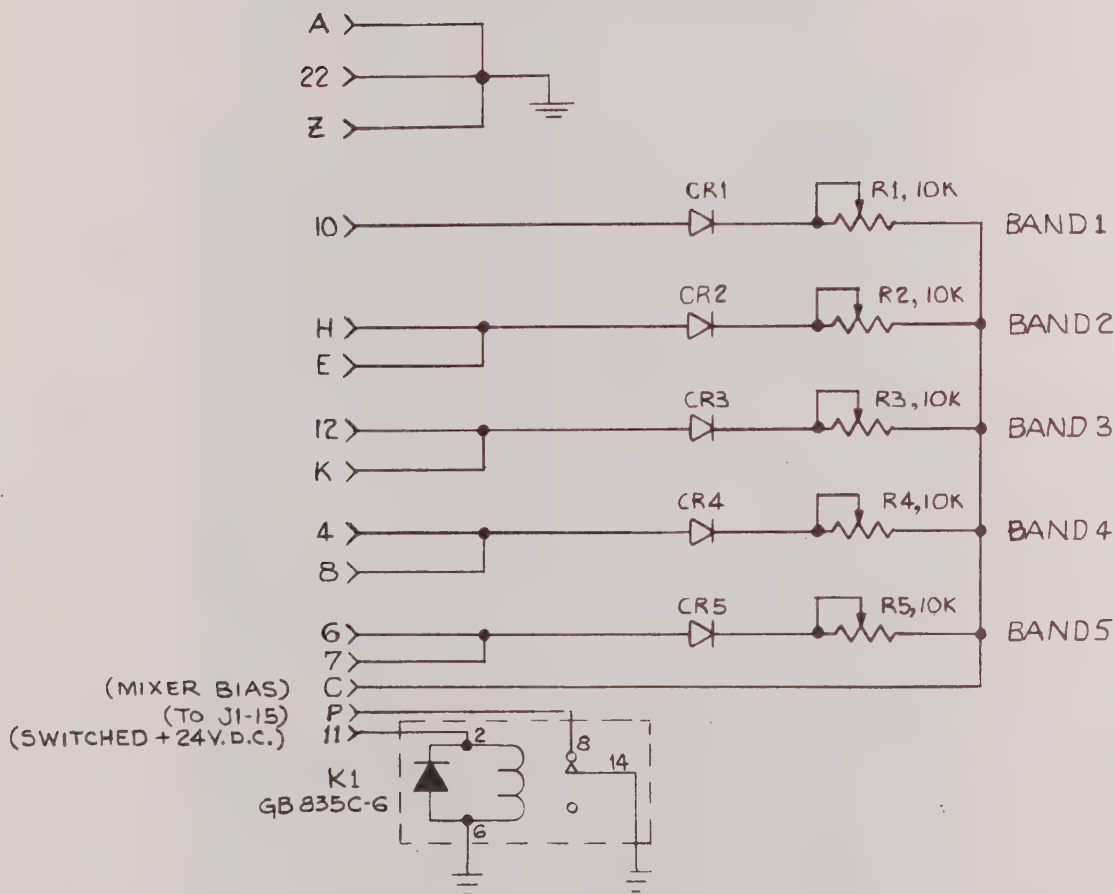


Figure 4-17. Bias Interface J2 Board (299334) (Sheet 1 of 2)

BIAS INTERFACE J2 BOARD (299334)

<u>Item</u>	<u>Description</u>	<u>FMC</u>	<u>Part No.</u>
CR1 thru CR5	Diode	03508	1N4009
K1	Relay	24211	GB835C-6
R1 thru R5	Resistor, variable, 10 k	80294	3009-P-1-103



CR1 - CR5 : 1N4009

Z1 : UA741

Figure 4-17. Bias Interface J2 Board (299334)
(Sheet 2 of 2)

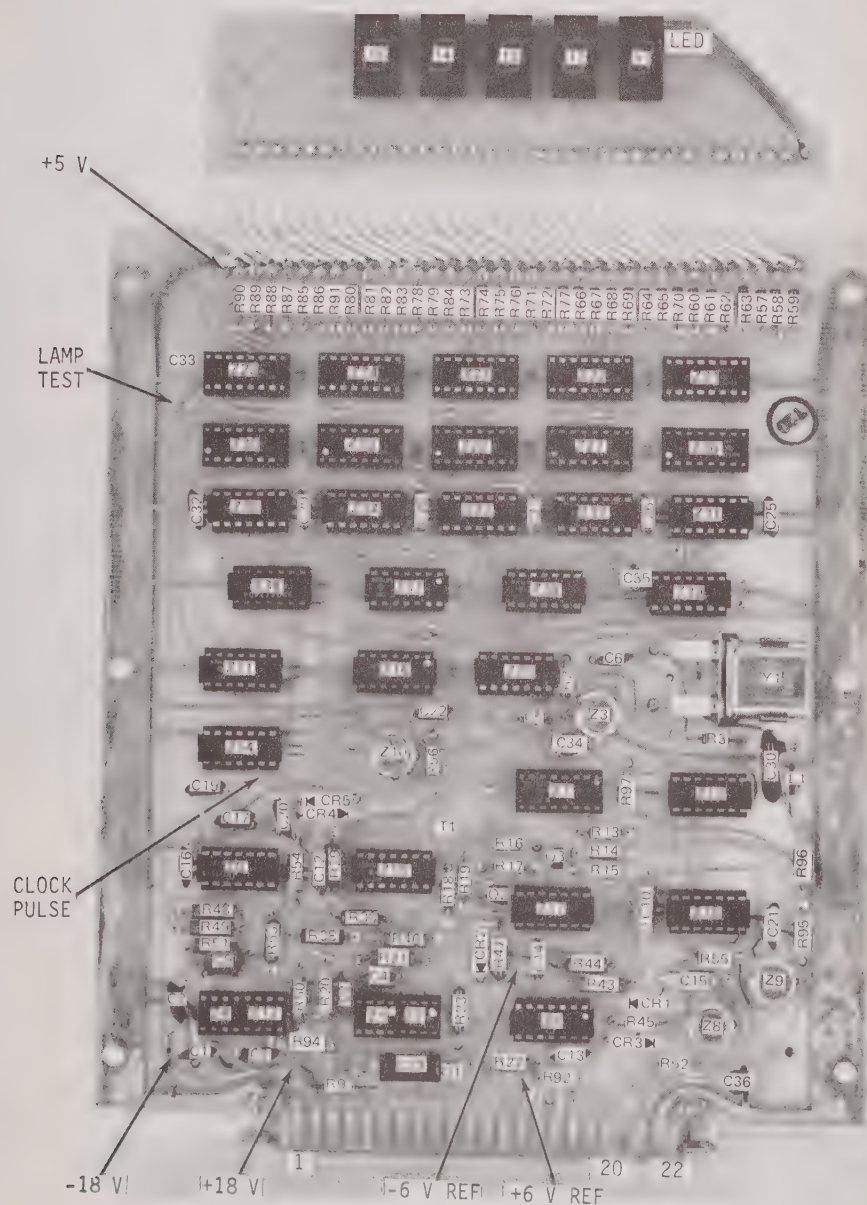


Figure 4-18. Digital Display J3 Board (209468) (Sheet 1 of 2)

DIGITAL DISPLAY J3 BOARD (299468)

<u>Item</u>	<u>Description</u>	<u>FMC</u>	<u>Part No.</u>
C1 thru C4	Capacitor, 0.01 μ F	56289	5HKS-S10
C5	Capacitor, 820 pF	71590	DD-821
C6	Capacitor, 3000 pF	71590	DD-302
C7	Not used		
C8, C9	Capacitor, 0.01 μ F	56289	5HKS-S10
C10	Capacitor, 27 μ F	81349	CS13BC276K
C11	Not used		
C12 thru C14	Capacitor, 0.01 μ F	56289	5HKS-S10
C15	Capacitor, 27 μ F	81349	CS13BC276K
C16, C17	Capacitor, 0.01 μ F	56289	5HKS-S10
C18	Not used		
C19 thru C22	Capacitor, 0.01 μ F	56289	5HKS-S10
C23	Capacitor, 0.1 μ F, $\pm 2\%$, 100 V	50930	K119Z-13 $\pm 2\%$
C24	Not used		
C25 thru C29	Capacitor, 0.01 μ F	56289	5HKS-S10
C30	Capacitor, 1500 pF	81349	CM06FD153J03
C31	Not used		
C32	Capacitor, 0.01 μ F	56289	5HKS-S10
C33	Not used		
C34, C35	Capacitor, 6.8 μ F	00752	299420-1
CR1 thru CR5	Diode	80131	1N4009
I1 thru I5	Led, readout	50436	5082-7730
L1	Coil, 270 μ H	71895	1025-78
Q1	Transistor	04713	2N4392
Q2	Transistor	04713	2N4124
Q3	Transistor	49956	2N4126
R1	Not used		
R2	Resistor, 56 k, 1/4 W	81349	RC07GF563J
R3	Resistor, 33 k, 1/4 W	81349	RC07GF333J
R4 thru R12	Not used		
R13	Resistor, 47 k, 1/4 W	81349	RC07GF473J
R14	Resistor, 3 k, 1/4 W	81349	RC07GF302J
R15	Resistor, 16 k, 1/4 W	81349	RC07GF163J
R16	Resistor, 10 k, 1/4 W	81349	RC07GF103J
R17	Resistor, 47 k, 1/4 W	81349	RC07GF473J
R18, R19	Resistor, 100 k, 1/4 W	81349	RC07GF104J
R20	Resistor, 13.3 k, 1/8 W	81349	RC60C1332F
R21	Resistor, 16.2 k, 1/8 W	81349	RN60C1622G
R22	Resistor, 10 k, 1/8 W	81349	RN60C1002F
R23	Resistor, 26.7 k, 1/8 W	81349	RN60C2672F
R24 thru R28	Not used		
R29, R30	Resistor, 20 k, 1/8 W	81349	RN60C2002F
R31 thru R37	Not used		
R38	Resistor, 1.5 k, 1/8 W	81349	RN60C1501F
R39 thru R42	Not used		
R43	Resistor, 4.64 k, 1/8 W	81349	RN60C4641F

DIGITAL DISPLAY J3 BOARD (299468) (cont)

<u>Item</u>	<u>Description</u>	<u>FMC</u>	<u>Part No.</u>
R44	Resistor, 16.5 k, 1/8 W	81349	RN60C1652F
R45	Resistor, 15 k, 1/4 W	81349	RC07GF153J
R46	Resistor, 15 k, 1/8 W	81349	RC60C1502F
R47	Resistor, 4.99 k, 1/8 W	81349	RN60C4991F
R48, R49	Resistor, 10 k, 1/8 W	81349	RN60C1002F
R50	Resistor, 9.09 k, 1/8 W	81349	RN60C9091F
R51	Resistor, 10 k, 1/8 W	81349	RN60C1002F
R52	Resistor, 15 k, 1/4 W	81349	RC07GF153J
R53, R54	Resistor, 100, 1/8 W	81349	RN60C1000F
R55	Resistor, 2.4 k, 1/4 W	81349	RC07GF242J
R56	Resistor, 1.5 k, 1/4 W	81349	RC07GF152J
R57 thru R91	Resistor, 240, 1/4 W	81349	RC07GF241J
R92	Resistor, 51 k, 1/4 W	81349	RC07GF513J
R93	Resistor, 100 k, 1/4 W	81349	RC07GF104J
R94	Resistor, 18 Meg, 1/4 W	81349	RC07GF186J
R95	Resistor, 1.5 k, 1/4 W	81349	RC07GF152J
R96	Resistor, 1 k, 1/4 W	81349	RC07GF102J
R97	Resistor, 47, 1/4 W	81349	RC07GF470J
Y1	Crystal, 250 kHz	00752	230479-5
Z1, Z2	IC	01295	SN72741P
Z3	IC	07263	U5B991429
Z4	IC	01295	SN72741P
Z5, Z6	IC	01295	SN72710N
Z7	IC	01295	SN7476N
Z8 thru Z10	IC	07263	U5B991429
Z11	IC	01295	SN7440N
Z12	IC	01295	SN72741P
Z13	Not used		
Z14, Z15	IC	01295	SN7400N
Z16	IC	01295	SN7440N
Z17 thru Z19	Not used		
Z20	IC	01295	SN7400N
Z21 thru Z25	IC	01295	SN7447N
Z26 thru Z30	IC	01295	SN7475N
Z31 thru Z35	IC	01295	SN74176N
Z36	IC	01295	SN7404N
Z37	IC	01295	SN7420N
Z38, Z39	IC	01295	SN7400N

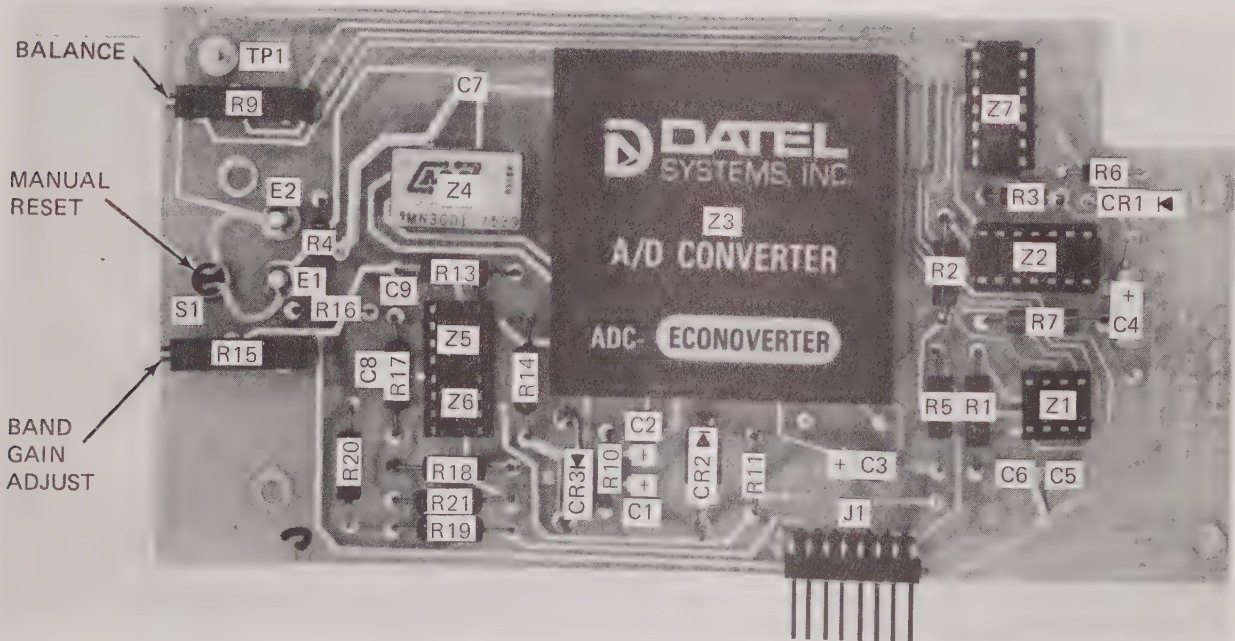
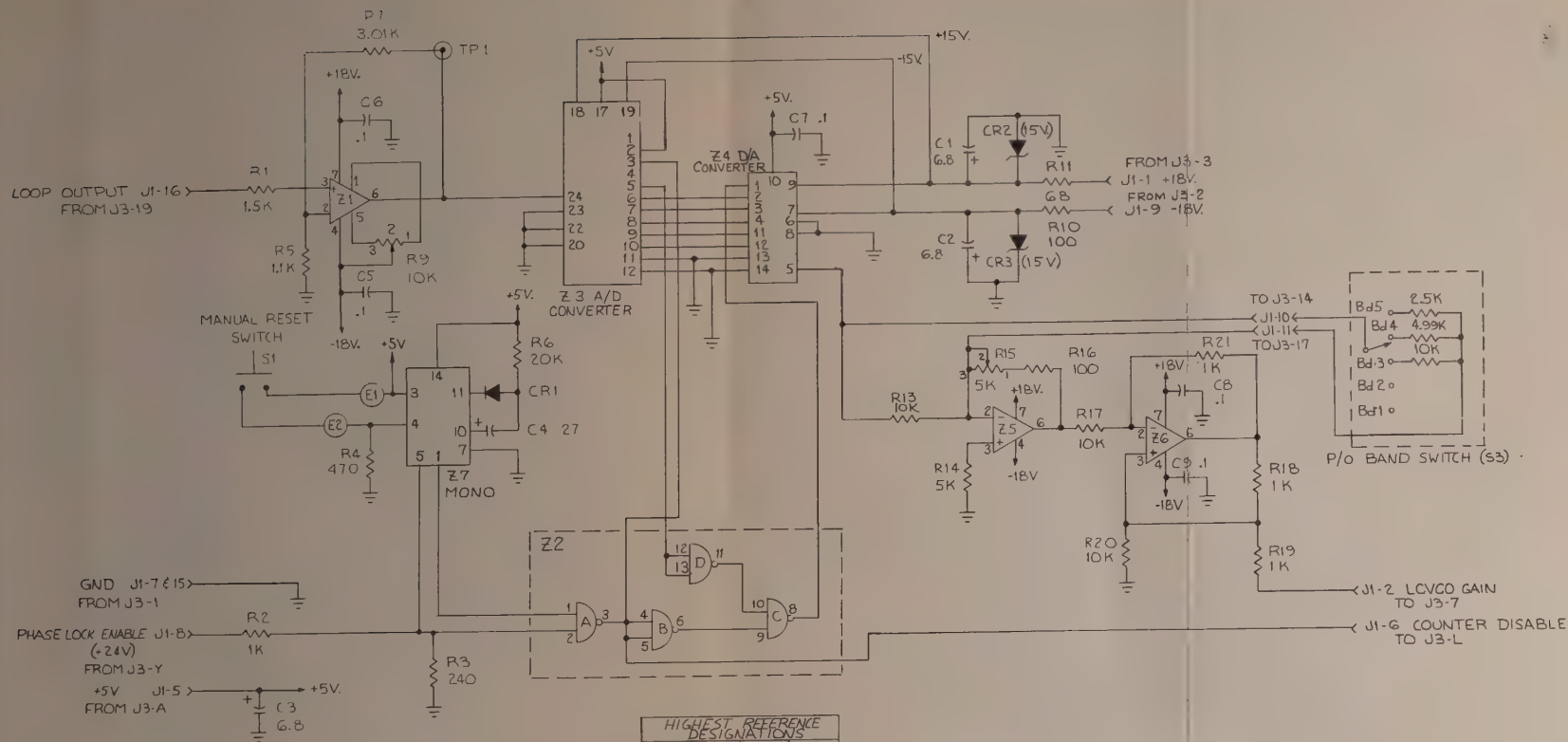


Figure 4-19. Auto Centering Board (299378)



- NOTES:
1. Z1, Z5 & Z6 - N5741N, Z2 - SN7400N, Z7 - SN74121N.
CR1 - IN4009
CR2, CR3 - 3024R.
 2. ON Z2 - PIN 7 IS GND, PIN 14 IS +5V.
 3. UNLESS OTHERWISE SPECIFIED,
ALL CAPACITORS ARE IN PFD.,
AND RESISTORS ARE IN Ω .

HIGHEST REFERENCE DESIGNATIONS			
R21	C9	CR3	Z7
REFERENCE DESIGNATIONS NOT USED			
R8, R12			

Figure 4-19. Auto Centering Board (299378)
(Sheet 2 of 2)

AUTO CENTERING BOARD (299378)

<u>Item</u>	<u>Description</u>	<u>FMC</u>	<u>Part No.</u>
C1 thru C3	Capacitor, electrolytic, 6.8 μ F	00752	299240-1
C4	Capacitor, electrolytic, 27 μ F		13BC276K
C5 thru C9	Capacitor, .1 μ F	00752	299245-1
CR1	Diode	03508	1N4009
CR2, CR2	Diode, zener	03508	1N3024B
R1	Resistor, 1.5 k, 1/8 W, 1%	81349	RN60C1501F
R2	Resistor, 1 k, 1/2 W, 5%	81349	RC20GF102J
R3	Resistor, 240, 1/4 W, 5%	81349	RC07GF241J
R4	Resistor, 470, 1/4 W, 5%	81349	RC07GF471J
R5	Resistor, 1.1 k, 1/8 W, 1%	81349	RN60C1101F
R6	Resistor, 20 k, 1/4 W, 5%	81349	RC07GF203J
R7	Resistor, 3.01 k, 1/8 W, 1%	81349	RN60C3011F
R8	Not used		
R9	Resistor, variable, 10 k	80294	3009P-1-103
R10	Resistor, 100, 1/4 W, 5%	81349	RC07GF101J
R11	Resistor, 68, 1/4 W, 5%	81349	RC07GF680J
R12	Not used		
R13	Resistor, 10 k, 1/8 W, 1%	81349	RN60C1002F
R14	Resistor, 5 k, 1/8 W, 1%	81349	RN60C5001F
R15	Resistor, variable, 5 k	80294	3009P-1-502
R16	Resistor, 100, 1/4 W, 5%	81349	RC07GF101J
R17	Resistor, 10 k, 1/8 W, 1%	81349	RN60C1002F
R18, R19	Resistor, 1 k, 1/8 W, 1%	81349	RN60C1001F
R20	Resistor, 1/8 W, 1%	81349	RN60C1002F
R21	Resistor, 1 k, 1/8 W, 1%	81349	RN60C1001F
S1	Switch, momentary	81073	39-3
Z1	IC	01295	N5741V
Z1	IC	01295	SN7400N
Z3	IC	31439	ADC ECONOVERTR
Z4	IC	50507	MN3001
Z5-Z6	IC	01295	N5471V
Z7	IC	01295	SN74121N

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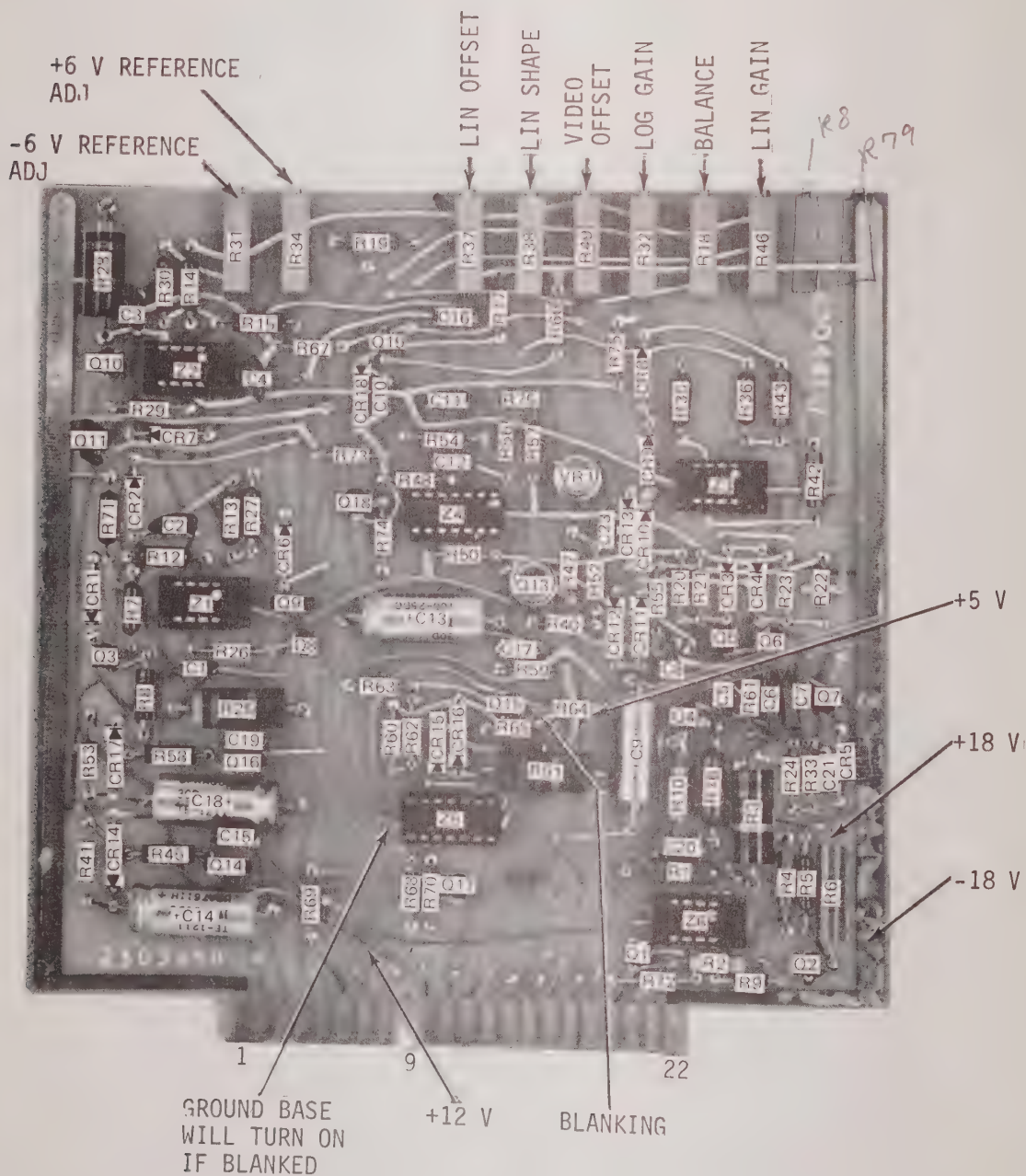
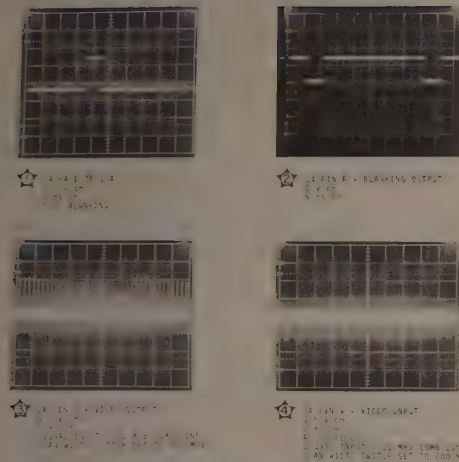


Figure 4-20. Preamplifier J4 Board (230480) (Sheet 1 of 2)



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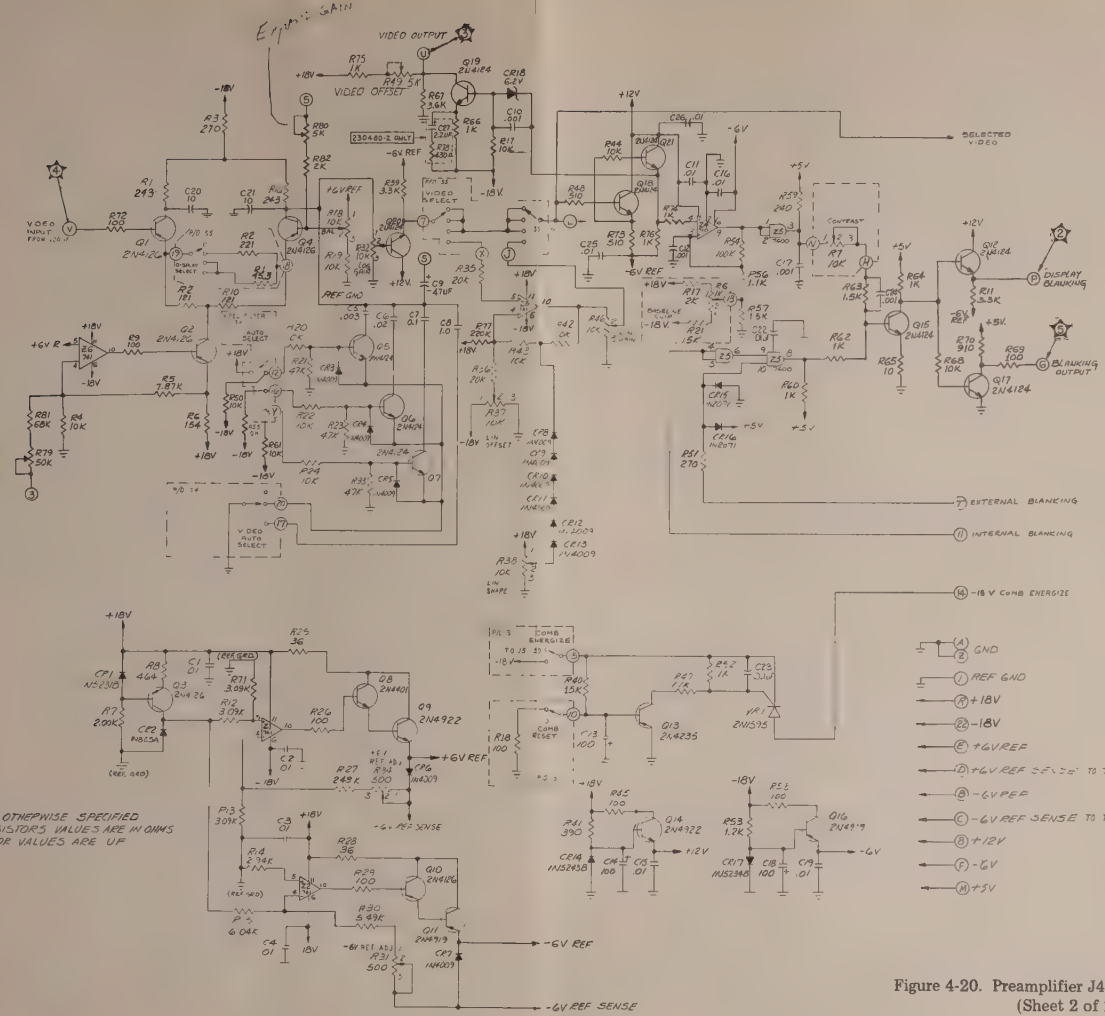


Figure 4-20. Preamplifier J4 Board (230480)
(Sheet 2 of 2)

PREAMPLIFIER J4 BOARD (230480)

<u>Item</u>	<u>Description</u>	<u>FMC</u>	<u>Part No.</u>
C1 thru C4	Capacitor, 0.01 μ F	56289	5HKS-S10
C5	Capacitor, 0.003 μ F	71590	DD-302
C6	Capacitor, 0.02 μ F	71590	DD-203
C7	Capacitor, 0.1 μ F, 75 V	71590	DDA-104
C8	Capacitor, 1.0 μ F, 3 V	71590	UK-105
C9	Capacitor, 47 μ F, 35 V	81349	CS13BF476K
C10	Capacitor, 0.001 μ F	81349	CK60AW102M
C11	Capacitor, 0.01 μ F	56289	5HKS-S10
C12	Capacitor, 0.001 μ F	81349	CK60AW102M
C13, C14	Capacitor, 100 μ F, 25 V	56289	TE-1211
C15, C16	Capacitor, 0.01 μ F	56289	5HKS-S10
C17	Capacitor, 0.001 μ F	81349	CK60AW102M
C18	Capacitor, 100 μ F, 25 V	56289	TE-1211
C19	Capacitor, 0.01 μ F	56289	5HKS-S10
C20, C21	Capacitor, 10 pF	71590	DD-100
C22, C23	Capacitor, 0.1 μ F	56289	5HKS-S10
CR1	Diode	03508	1N5231B
CR2	Diode	05245	1N825A
CR3 thru CR13	Diode	03508	1N4009
CR14	Diode	03508	1N5243B
CR15, CR16	Diode	03508	1N2071 (114233-2)
CR17	Diode	03508	1N5234B
CR18	Diode	05245	1N825A
Q1 thru Q4	Transistor	49956	2N4126
Q5 thru Q7	Transistor	04713	2N4124
Q8	Transistor	04713	2N4401
Q9	Transistor	49956	2N4922
Q10	Transistor	49956	2N4126
Q11	Transistor	04713	2N4919
Q12	Not used		
Q13	Transistor	04713	2N4235
Q14	Transistor	49956	2N4922
Q15	Transistor	04713	2N4124
Q16	Transistor	04713	2N4919
Q17 thru Q19	Transistor	04713	2N4124
R1	Resistor, 243, 1/4 W	81349	RN65C2430F
R2	Resistor, 121, 1/8 W	81349	RN60C1210F
R3	Resistor, 270, 2 W	81349	RC42GF271J
R4	Resistor, 10 k, 1/8 W	81349	RN60C1002F
R5	Resistor, 7.87 k, 1/8 W	81349	RN60C7871F
R6	Resistor, 154, 1/2 W	81349	RN70D1540F
R7	Resistor, 2 k, 1/8 W	81349	RN60C2001F
R8	Resistor, 464, 1/8 W	81349	RN60C4640F
R9	Resistor, 100, 1/4 W	81349	RC07GF101J
R10	Resistor, 121, 1/8 W	81349	RN60C1210F
R11	Not used		

PREAMPLIFIER J4 BOARD (230480) (cont)

<u>Item</u>	<u>Description</u>	<u>PMC</u>	<u>Part No.</u>
R12, R13	Resistor, 3.09 k, 1/8 W	81349	RN60C3091F
R14	Resistor, 2.94 k, 1/8 W	81349	RN60C2941F
R15	Resistor, 6.04 k, 1/8 W	81349	RN60C6041F
R16	Resistor, 243, 1/4 W	81349	RN65C2430F
R17	Resistor, 10 k, 1/4 W	81349	RC07GF103J
R18	Resistor, variable, 10 k	80294	3009-P-103
R19	Resistor, 10 k, 1/8 W	81349	RN60C1002F
R20	Resistor, 10 k, 1/4 W	81349	RN07GF103J
R21	Resistor, 47 k, 1/4 W	81349	RC07GF473J
R22	Resistor, 10 k, 1/4 W	81349	RC07GF103J
R23	Resistor, 47 k, 1/4 W	81349	RC07GF473J
R24	Resistor, 10 k, 1/4 W	81349	RC07GF103J
R25	Resistor, 36, 2 W	81349	RC42GF360J
R26	Resistor, 100, 1/4 W	81349	RC07GF101J
R27	Resistor, 2.49 k, 1/8 W	81349	RN60C2491F
R28	Resistor, 36, 2 W	81349	RC42GF360J
R29	Resistor, 100, 1/4 W	81349	RC07GF101J
R30	Resistor, 5.49 k, 1/8 W	81349	RN60C5491F
R31	Resistor, variable, 500	80294	3009-P-501
R32	Resistor, variable, 10 k	80294	3009-P-103
R33	Resistor, 47 k, 1/4 W	81349	RC07GF473J
R34	Resistor, variable, 500	80294	3009-P-501
R35, R36	Resistor, 20 k, 1/8 W	81349	RN60C2002F
R37, R38	Resistor, variable, 10 k	80294	3009-P-103
R39	Not used		
R40	Resistor, 15 k, 1/4 W	81349	RC07GF153J
R41	Resistor, 390, 1/4 W	81349	RC07GF391J
R42, R43	Resistor, 10 k, 1/8 W	81349	RN60C1002F
R44	Not used		
R45	Resistor, 100, 1/2 W	81349	RC20GF101J
R46	Resistor, variable, 10 k	80294	3009-P-103
R47	Resistor, 1.1 k, 1/4 W	81349	RC07GF112J
R48	Resistor, 510, 1/4 W	81349	RC07GF511J
R49	Resistor, variable, 5 k	80294	3009P-1-502
R50	Resistor, 10 k, 1/4 W	81349	RC07GF103J
R51	Resistor, 270, 2 W	81349	RC42GF271J
R52	Resistor, 1 k, 1/4 W	81349	RC07GF102J
R53	Resistor, 1.2 k, 1/4 W	81349	RC07GF122J
R54	Resistor, 100 k, 1/4 W	81349	RC07GF104J
R55	Resistor, 10 k, 1/4 W	81349	RC07GF103J
R56	Resistor, 1.1 k, 1/4 W	81349	RC07GF112J
R57	Resistor, 620, 1/4 W	81349	RC07GF621J
R58	Resistor, 100, 1/2 W	81349	RC20GF101J
R59	Resistor, 240, 1/4 W	81349	RC07GF241J
R60	Resistor, 1 k, 1/4 W	81349	RC07GF102J
R61	Resistor, 10 k, 1/4 W	81349	RC07GF103J

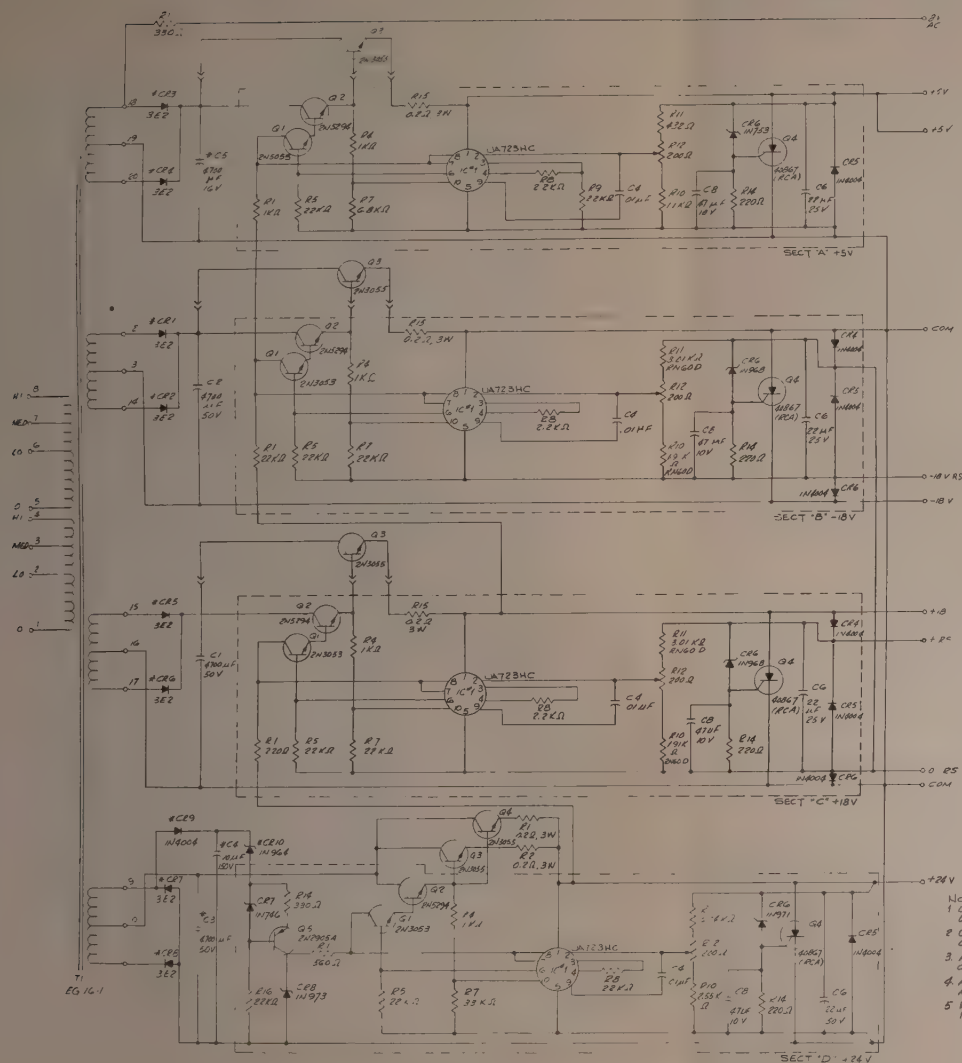
PREAMPLIFIER J4 BOARD (230480) (cont)

<u>Item</u>	<u>Description</u>	<u>FMC</u>	<u>Part No.</u>
R62	Resistor, 1 k, 1/4 W	81349	RC07GF102J
R63	Resistor, 1.5 k, 1/4 W	81349	RC07GF152J
R64	Resistor, 1 k, 1/4 W	81349	RC07GF102J
R65	Resistor, 10, 1/4 W	81349	RC07GF100J
R66	Resistor, 2 k, 1/4 W	81349	RC07GF202J
R67	Resistor, 1.5 k, 1/4 W	81349	RC07GF152J
R68	Resistor, 10 k, 1/4 W	81349	RC07GF103J
R69	Resistor, 100, 1/4 W	81349	RC07GF101J
R70	Resistor, 910, 1/4 W	81349	RC07GF911J
R71	Resistor, 3.09 k, 1/8 W	81349	RN60C3091F
R72	Resistor, 100, 1/4 W	81349	RC07GF101J
R73, R74	Resistor, 510, 1/4 W	81349	RC07GF511J
R75	Resistor, 1 k, 1/4 W	81349	RC07GF102J
VR1	Transistor	01295	2N1595
Z1 thru Z3	IC	01295	SN72741P
Z4	IC	01295	SN72710N
Z5	IC	01295	SN7400N
Z6	IC	01295	SN72741P

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Figure 4-21. Power Supply (230426-2) (Sheet 1 of 2)



- NOTES
- COMPONENTS WITHIN DOTTED LINES LOCATED ON MAIN REGULATORY BOARD.
 - COMPONENTS MARKED * LOCATED ON CAPACITIVE REGULATOR BOARD.
 - ALL OTHER COMPONENTS LOCATED ON CHASSIS.
 - ALL RESISTORS, UNLESS OTHERWISE SPECIFIED, ARE 1/4 WATT, 5% TOL.
 - K=1,000
M=1,000,000

Figure 4-21. Power Supply (230426-2)
(Sheet 2 of 2)

POWER SUPPLY (230426-2)

<u>Item</u>	<u>Description</u>	<u>FMC</u>	<u>Part No.</u>
C1	Capacitor, 68 μ F, 63 V	25403	ET680X063A00
C2	Capacitor, 0.01 μ F, 250 V	25403	C280AE/A10K
C3	Capacitor, 68 μ F, 63 V	25403	ET680X063A00
C4	Capacitor, 0.01 μ F, 250 V	25403	C280AE/A10K
C5	Capacitor, 68 μ F, 63 V	25403	ET680X063A00
C6	Capacitor, 0.01 μ F, 250 V	25403	C280AE/A10K
C7	Capacitor, 68 μ F, 63 V	25403	ET680X063A00
C8	Capacitor, 0.01 μ F, 250 V	25403	C280AE/A10K
C9	Capacitor, 150 μ F, 25 V	25403	ET151X025A6
C10, C11	Capacitor, 3.3 μ F, 25 V	25403	E7EP3X025A1
C101	Capacitor, 8000 μ F, 40 V	03508	86F5613M1
C102	Capacitor, 4000 μ F, 40 V	03508	86F156M1
C103 thru C106	Capacitor, 0.220 μ F, 250 V, 10%	25403	C280AE/A220K
C107	Capacitor, 5200 μ F, 30 V	03508	86F147M1
CR1, CR2	Diode	03508	1N5059
CR3 thru CR5	Diode	03508	1N645
CR6 thru CR9	Diode	03508	1N5059
CR101, CR102	Diode	03508	1N1202A
CR103 thru CR106	Diode	03508	A15A
Q1 thru Q6	Transistor	49956	2N3567
Q7	Transistor	49956	2N5135
Q8 thru Q20	Transistor	49956	2N3567
Q101 thru Q108	Transistor	01295	2N3055
R1	Resistor, 270, 1/2 W, 10%	01121	RC20GF271K
R2	Resistor, 1.2 k, 1/2 W, 10%	01121	RC20GF122K
R3	Resistor, 470, 1/2 W, 10%	01121	RC20GF471K
R4	Resistor, 8.2 k, 1/2 W, 10%	01121	RC20GF822K
R5	Resistor, 10 k, Pot WW	71450	BK64204
R6	Resistor, 470, 1/2 W, 10%	01121	RC20GF471K
R7	Resistor, 82 k, 1/2 W, 10%	01121	RC20GF823K
R8	Resistor, 470, 1/2 W, 10%	01121	RC20GF471K
R9	Resistor, 22 k, 1/2 W, 10%	01121	RC20GF222K
R10	Resistor, 470, 1/2 W, 10%	01121	RC20GF471K
R11	Resistor, 2.49 k, 3 W, WW, 1%	09969	RW79U2491F
R12	Resistor, 8.2 k, 1/2 W, 10%	01121	RC20GF822K
R13	Resistor, 4.7 k, 1/2 W, 10%	01121	RC20GF472K
R14	Resistor, 1 k, 3 W, WW, 1%	09969	RW79U1001F
R15	Resistor, 2.49, 3 W, WW, 1%	09969	RW79U2491F
R16	Resistor, variable, 500, WW	71450	BK64200
R17	Resistor, 3.3 k, 1/2 W, 10%	01121	RC20GF332F
R18, R19	Resistor, 0.33 5 W	75042	PW5
R20	Resistor, 470, 1/2 W, 10%	01121	RC20GF471K
R21, R22	Resistor, 8.2 k, 1/2 W, 10%	01121	RC20GF822K
R23	Resistor, 470, 1/2 W, 10%	01121	RC20GF471K
R24	Resistor, variable, 10 k, WW	71450	BK64204

POWER SUPPLY (230426-2) (cont)

<u>Item</u>	<u>Description</u>	<u>FMC</u>	<u>Part No.</u>
R25	Resistor, 68 k, 1/2 W, 10%	01121	RC20GF683K
R26	Resistor, 3.3 k, 1/2 W, 10%	01121	RC20GF332K
R27	Resistor, 470, 1/2 W, 10%	01121	RC20GF471K
R28	Resistor, 2.2 k, 1/2 W, 10%	01121	RC20GF222K
R29	Resistor, 2.05 k, 3 W, WW, 1%	09969	RW79U2051F
R30	Resistor, 470, 1/2 W, 10%	01121	RC20GF471K
R31	Resistor, 3.3 k, 1/2 W, 10%	01121	RC20GF332K
R32	Resistor, 1 k, 3 W, WW 1%	09969	RS941001F
R33	Resistor, 2.05 k, 3 W, WW, 1%	09969	RW79U2051F
R34	Resistor, variable, 500, WW	71450	BK64200
R35	Resistor, 0.33, 5 W	75042	PW5
R36	Resistor, 680, 1/2 W, 10%	01121	RC20GF681F
R37	Resistor, 8.2 k, 1/2 W, 10%	01121	RC20GF822K
R38	Resistor, 470, 1/2 W, 10%	01121	RC20GF471K
R39	Resistor, variable, 10 k, WW	71450	BK64204
R40	Resistor, 68 k, 1/2 W, 10%	01121	RC20GF683K
R41	Resistor, 470, 1/2 W, 10%	01121	RC20GF471K
R42	Resistor, 2.2 k, 1/2 W, 10%	01121	RC20GF222K
R43	Resistor, 120 k, 1/2 W, 10%	01121	RC20GF124K
R44	Resistor, 1 k, 1/2 W, 10%	01121	RC20GF102K
R45	Resistor, 10 k, 1/2 W, 10%	01121	RC20GF103K
R46	Resistor, 820, 1/2 W, 10%	01121	RC20GF821K
R47	Resistor, 1.2 k, 1/2 W, 10%	01121	RC20GF122K
R48	Resistor, 8.2 k, 1/2 W, 10%	01121	RC20GF822K
R49	Resistor, 4.7 k, 1/2 W, 10%	01121	RC20GF472K
R50	Resistor, variable, 500, WW	71450	BK64200
R51	Resistor, 1.87 k, 3 W, WW, 1%	09969	RW79U1871F
R52	Resistor, 2.05 k, 3 W, WW, 1%	09969	RW79U2051F
R53	Resistor, 0.1, 5 W	75042	PW5
R54	Resistor, 470, 1/2 W, 10%	01121	RC20GF471K
R55	Resistor, 8.2 k, 1/2 W, 10%	01121	RC20GF822K
R56	Resistor, 3.3 k, 1/2 W, 10%	01121	RC20GF332K
R57	Resistor, 1.87 k, 3 W, WW, 1%	09969	RW79U1871F
R58	Resistor, 8.2 k, 1/2 W, 10%	01121	RC20GF822K
R59	Resistor, 1.5 k, 1/2 W, 10%	01121	RC20GF152K
R60	Resistor, 470, 1/2 W, 10%	01121	RC20GF471K
R61	Resistor, variable, 10 k, WW	71450	BK64204
R62	Resistor, 15 k, 1/2 W, 10%	01121	RC20GF153K
R63	Resistor, 470, 1/2 W, 10%	01121	RC20GF471K
R64	Resistor, 820, 1/2 W, 10%	01121	RC20GF821K
R65, R66	Resistor, 2.2 k, 1/2 W, 10%	01121	RC20GF222K
R67	Resistor, 1 k, 1/2 W, 10%	01121	RC20GF102K
R68	Resistor, variable, 250, WW	71450	BK64199
R69	Resistor, 442, 3 W, WW, 1%	09969	RW79U4420F
R70	Resistor, 1 k, 3 W, WW, 1%	09969	RW791001F
R71, R72	Resistor, 100, 1/2 W, 10%	01121	RC20GF101K

POWER SUPPLY (230426-2) (cont)

<u>Item</u>	<u>Description</u>	<u>FMC</u>	<u>Part No.</u>
SCR1, SCR2	Silcon Cont Rect	04713	C122F
TB1	Terminal Block	75382	600-8
TH1	Thermostat 85° NC	74389	Model U
T1	Transformer	09004	C18260
VR1	Diode, zener	81031	1N765B
VR2	Diode, zener	81031	1N821
VR3	Diode, zener	81031	1N756A
VR4	Diode, zener	81031	1N963B
VR5	Diode, zener	81031	1N821
VR6	Diode, zener	81031	1N963B
VR7	Diode, zener	81031	1N748
VR8	Diode, zener	81031	1N821
VR9	Diode, zener	81031	1N753A
VR10	Diode, zener	81031	1N970B
VR11	Diode, zener	81031	1N971B
VR12	Diode, zener	81031	1N970B
C1 thru C3	Capacitor, electrolytic, 4700 μ F, 50 V	03508	86F556
C4	Capacitor, electrolytic, 10 μ F, 150 V	56289	TE1507
CR1 thru CR5	Diode	81031	3E2
CR5A thru CR5D	Diode	81031	1N4224
CR6	Diode	81031	3E2
CR6A	Diode	81031	1N753
CR6B, CR6C	Diode	81031	1N968
CR6D	Diode	81031	1N971
CR7	Diode	81031	3E2
CR7D	Diode	81031	1N746
CR8	Diode	81031	3E2
CR9	Diode	81031	1N4004
CR10	Diode	81031	1N964
1C1A thru 1C1D	IC	07263	UA723HC
Q1A thru Q1D	Transistor	81031	2N3053
Q2A thru Q2D	Transistor	81031	2N5294
Q3A thru Q3D	Transistor	81031	2N3055
Q4A thru Q4D	SCR		40867
Q5D	Transistor	81031	2N2905A
R1	Resistor, 330, 1/4 W	81031	RC07GF331J
R1A	Resistor, 1000, 1/4 W	81031	RC07GF102J
R1B	Resistor, 2200, 1/4 W	81031	RC07GF222J
R1C	Resistor, 220, 1/4 W	81031	RC07GF221J
R1D	Resistor, 560, 1/4 W	81031	RC07GF561J
R4A thru R4D	Resistor, 1000, 1/4 W	81031	RC07GF102J
R5A thru R5D	Resistor, 22 k, 1/4 W	81031	RC07GF223J
R6	Not Used		

POWER SUPPLY (230426-2) (cont)

<u>Item</u>	<u>Description</u>	<u>FMC</u>	<u>Part No.</u>
R7A	Resistor, 6800, 1/4 W	81031	RC07GF682J
R7B, R7C	Resistor, 4700, 1/4 W	81031	RC07GF472J
R7D	Resistor, 22 k, 1/4 W	81031	RC07GF223J
R8A thru R8D	Resistor, 2200, 1/4 W	81031	RC07GF222J
R9A	Resistor, 2200, 1/4 W	81031	RC07GF222J
R10A	Resistor, 1100, 1/4 W	81031	RN60D1101F
R10B, R10C	Resistor, 1910, 1/4 W	81031	RN60D1911F
R10D	Resistor, 2550, 1/4 W	81031	RN60D2551F
R11A	Resistor, 432, 1/4 W	81031	RN50D4320F
R11B, R11C	Resistor, 3010, 1/4 W	81031	RN60D3010F
R11D	Resistor, 6040, 1/4 W	81031	RN60D6040F
R12A thru R12D	Resistor, variable, 200		MTC2261
R13	Not used		
R14A thru R14D	Resistor, 220, 1/4 W	81031	RC07GF221J
R16D	Resistor, 22 k, 1/4 W	81031	RC07GF223J
R17D	Resistor, 330, 1/4 W	81031	RC07GF331J
T1	Transformer, power		EG16-1

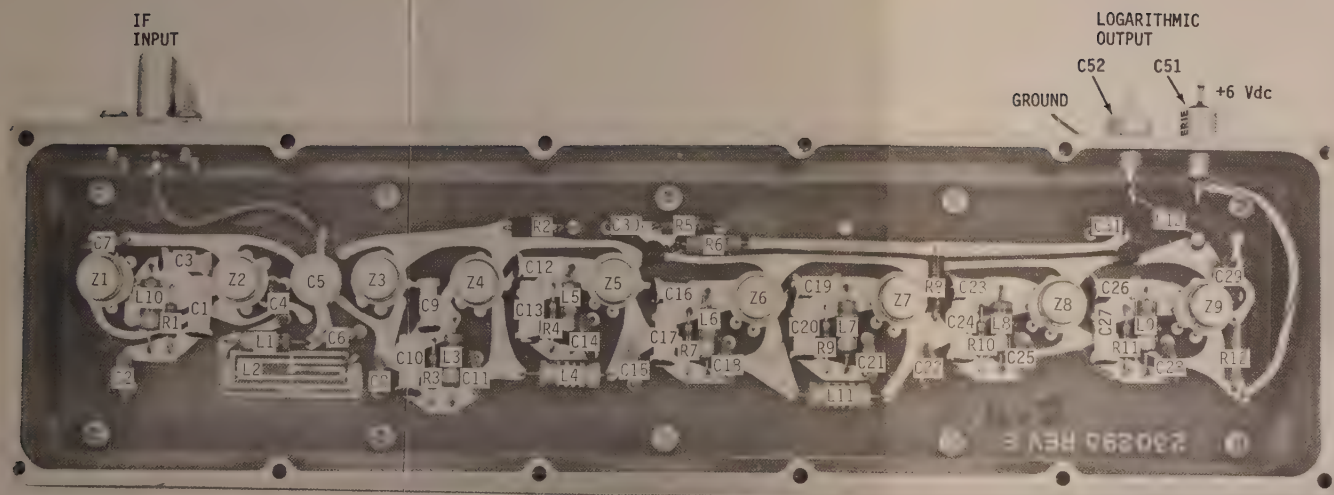


Figure 4-22. Log IF Amplifier (230390) (Sheet 1 of 2)

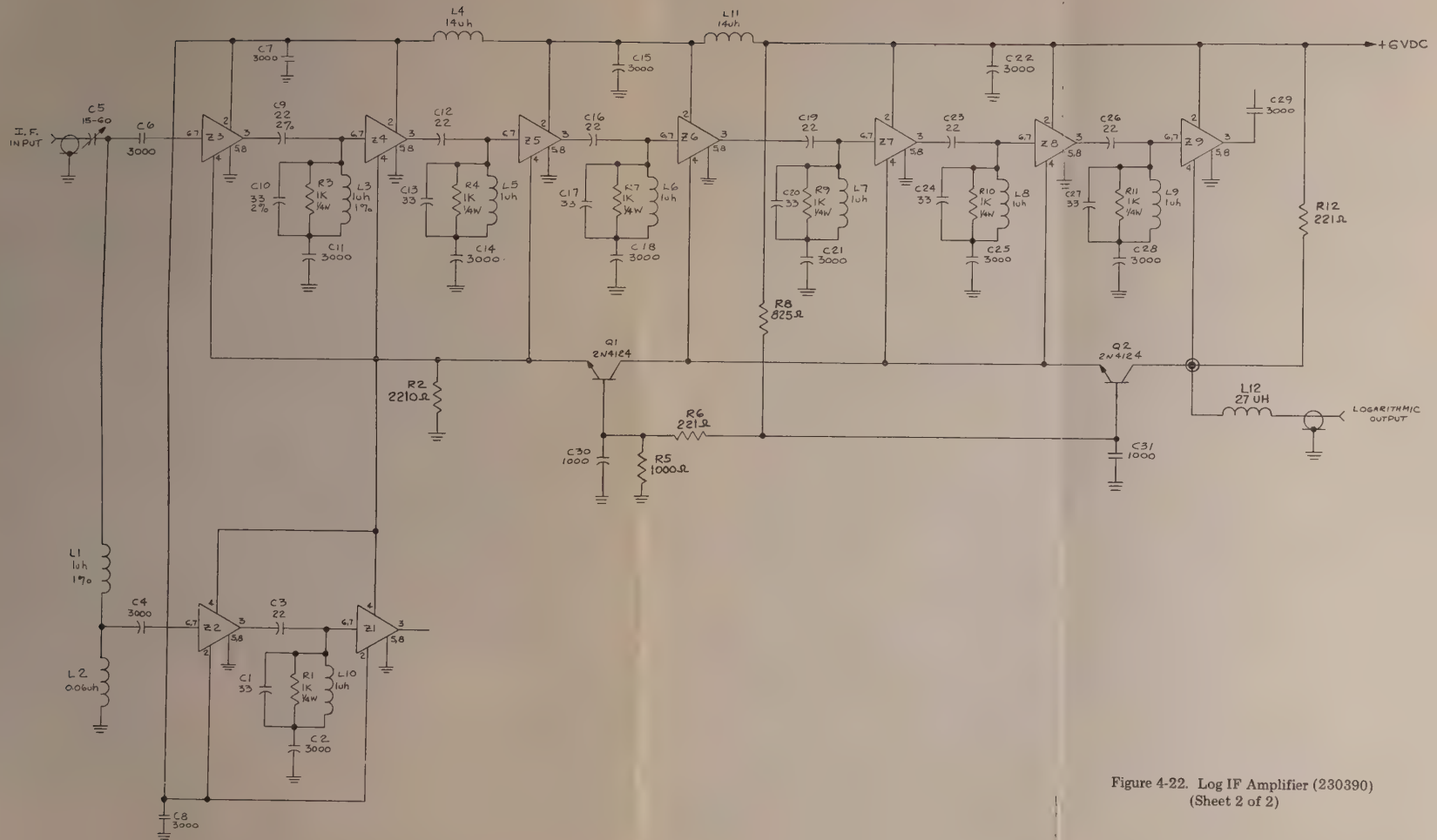


Figure 4-22. Log IF Amplifier (230390)
(Sheet 2 of 2)

LOG IF AMPLIFIER (230390)

<u>Item</u>	<u>Description</u>	<u>FMC</u>	<u>Part No.</u>
C51	Capacitor, filter	50056	MF204
C52	Capacitor, feed-thru, 1000 pF	00752	208674-1
L12	Inductor, fixed, 27 μ H	71895	1025-54
	LOG IF Board	00752	230294

LOG IF BOARD (230924)

<u>Item</u>	<u>Description</u>	<u>FMC</u>	<u>Part No.</u>
C1	Capacitor, 33 pF, $\pm 2\%$	72982	308-00-COGO330G
C2	Capacitor, 3000 pF	71590	DD-302
C3	Capacitor, 22 pF, $\pm 2\%$	72982	301-00-COGO220G
C4	Capacitor, 3000 pF	71590	DD-302
C5	Capacitor, variable, 15-60 pF	72982	538-011-F15-60
C6 thru C8	Capacitor, 3000 pF	71590	DD-302
C9	Capacitor, 22 pF, $\pm 2\%$	72982	301-000-COGO220G
C10	Capacitor, 33 pF, $\pm 2\%$	72982	308-000-COGO330G
C11	Capacitor, 3000 pF	71590	DD-302
C12	Capacitor, 22 pF, $\pm 2\%$	72982	301-000-COGO220G
C13	Capacitor, 33 pF, $\pm 2\%$	72982	308-000-COGO330G
C14, C15	Capacitor, 3000 pF	71590	DD-302
C16	Capacitor, 22 pF, $\pm 2\%$	72982	301-000-COGO220G
C17	Capacitor, 33 pF, $\pm 2\%$	72982	308-000-COGO330G
C18	Capacitor, 3000 pF	71590	DD-302
C19	Capacitor, 22 pF, $\pm 2\%$	72982	301-000-COGO220G
C20	Capacitor, 33 pF, $\pm 2\%$	72982	308-000-COGO330G
C21, C22	Capacitor, 3000 pF	71590	DD-302
C23	Capacitor, 22 pF, $\pm 2\%$	72982	301-000-COGO220G
C24	Capacitor, 33 pF, $\pm 2\%$	72982	308-000-COGO330G
C25	Capacitor, 3000 pF	71590	DD-302
C26	Capacitor, 22 pF, $\pm 2\%$	72982	301-000-COGO220G
C27	Capacitor, 33 pF, $\pm 2\%$	72982	308-000-COGO330G
C28, C29	Capacitor, 3000 pF	71590	DD-302
C30, C31	Capacitor, 1000 pF	81349	CK60AW102M
C32 thru C50	Not used		
L1	Inductor, 1 μ H, 1%	97469	4425-6F
L2	Not used		
L3	Inductor, 1 μ H, 1%	97469	4425-6F
L4	Inductor, 14 μ H	00752	115297-2
L5 thru L10	Inductor, 1 μ H, 1%	97469	4425-6F
L11	Inductor, 14 μ H	00752	115297-2
Q1, Q2	Transistor	04713	2N4124
R1	Resistor, 1 k, 1/4 W	81349	RC07GF102J
R2	Resistor, 2.21 k, 1/8 W	81349	RN60C2211F
R3, R4	Resistor, 1 k, 1/4 W	81349	RC07GF102J
R5	Resistor, 1 k, 1/8 W	81349	RN60C1001F
R6	Resistor, 221, 1/8 W	81349	RN60C2210F
R7	Resistor, 1 k, 1/4 W	81349	RC07GF102J
R8	Resistor, 825, 1/8 W	81349	RN60C8250F
R9 thru R11	Resistor, 1 k, 1/4 W	81349	RC07GF102J
R12	Resistor, 221, 1/8 W	81349	RN60C2210F
Z1 thru Z9	IC	00752	230541-3

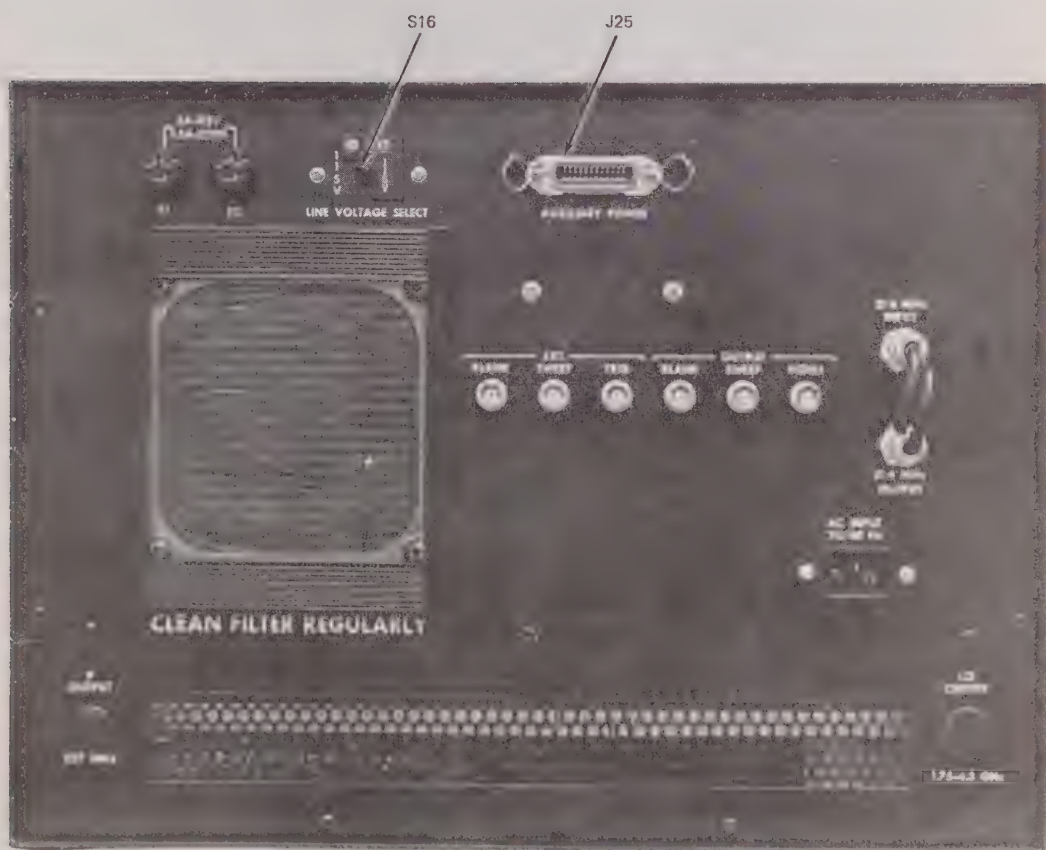


Figure 4-23. Rear Panel

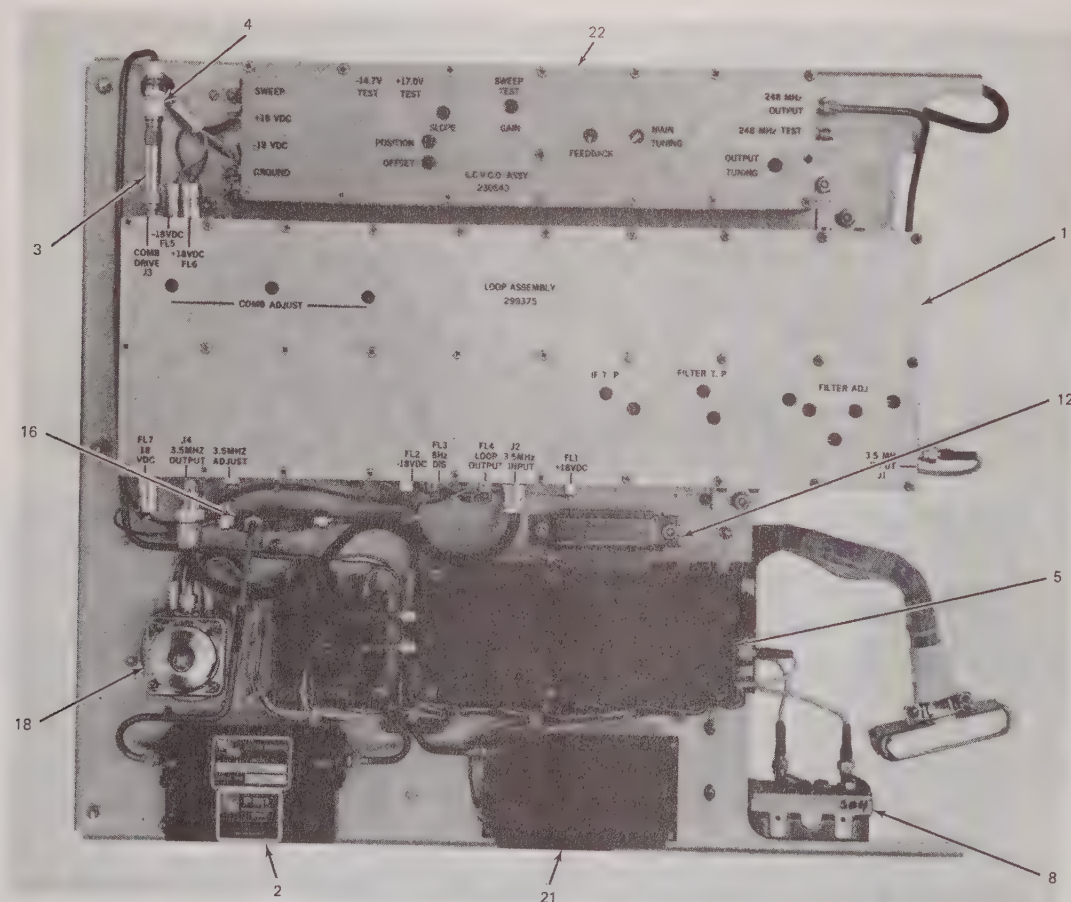


Figure 4-24. RF ASSEMBLY (299352) (Sheet 1 of 2)

RF ASSEMBLY (299352)

<u>Item</u>	<u>Description</u>	<u>FMC</u>	<u>Part No.</u>
1	Loop Assembly	00752	299375
2	Isolator	00752	230215
3	Comb Generator	00752	230471-2
4	Fixed Attenuator (10 db)	00752	230195-3
5	Loop Mixer/Filter	00752	230224
6	Mixer Bias Assembly	00752	230500
7	Band Pass Filter	00752	299374
8	RF Amplifier Assembly (15 db)	00752	230625
9	IF Assembly	00752	299350
10	RF Switch	00752	231079
11	Low Pass Filter	00752	230191
12	Microwave Mixer	00752	230567
13	Amplifier Assembly (20 db)	00752	230713

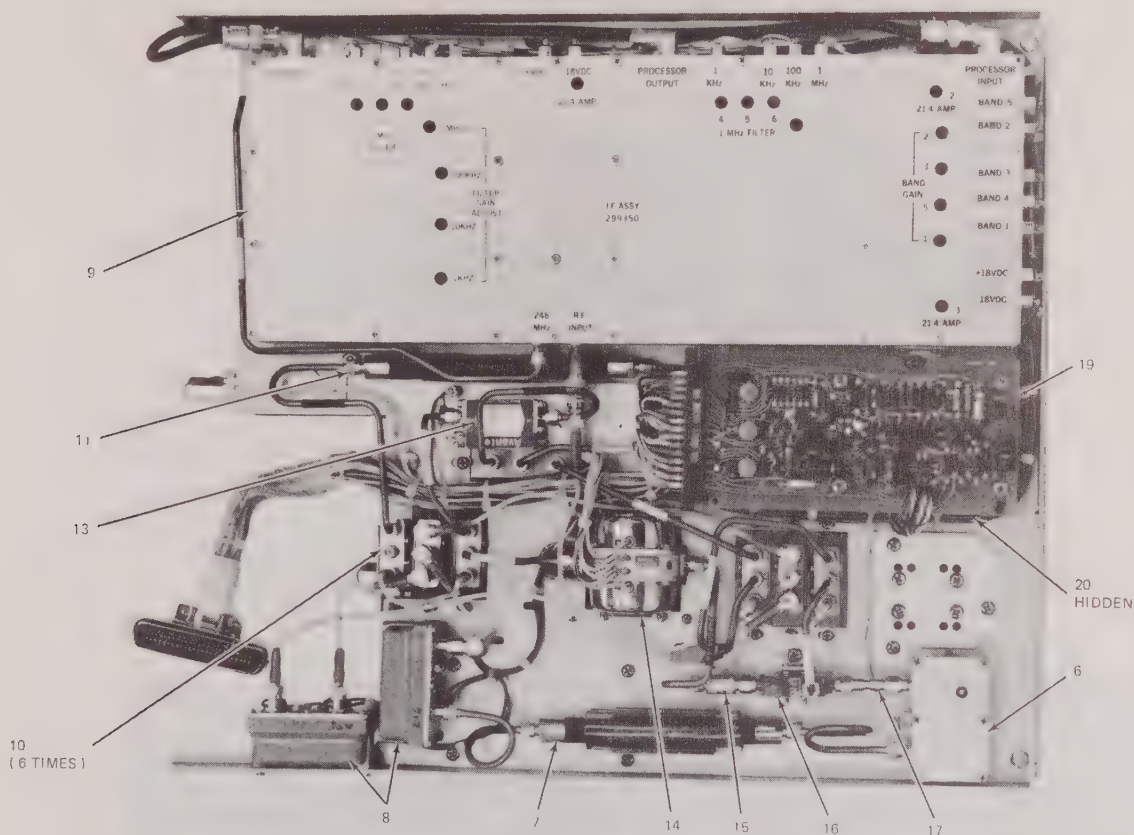


Figure 4-24. RF ASSEMBLY (299352) (Sheet 2 of 2)

RF ASSEMBLY (299352)

Item	Description	FMC	Part No.
14	YIG Filter	00752	299463
15	Fixed Attenuator (6 db)	00752	230195-5
16	Coupler, 6 db	00752	230194
17	Harmonic Mixer	00752	230478
18	YIG Oscillator (VCO)	00752	230186
19	YIG Driver Board	00752	299395
20	YIG Driver Heat Sink Assembly	00752	299400
21	2060 Oscillator	00752	230817
22	LCVCO Assembly	00752	230543
CR1, CR2	Diode		1N2071
R1	Resistor		RC42GF390J

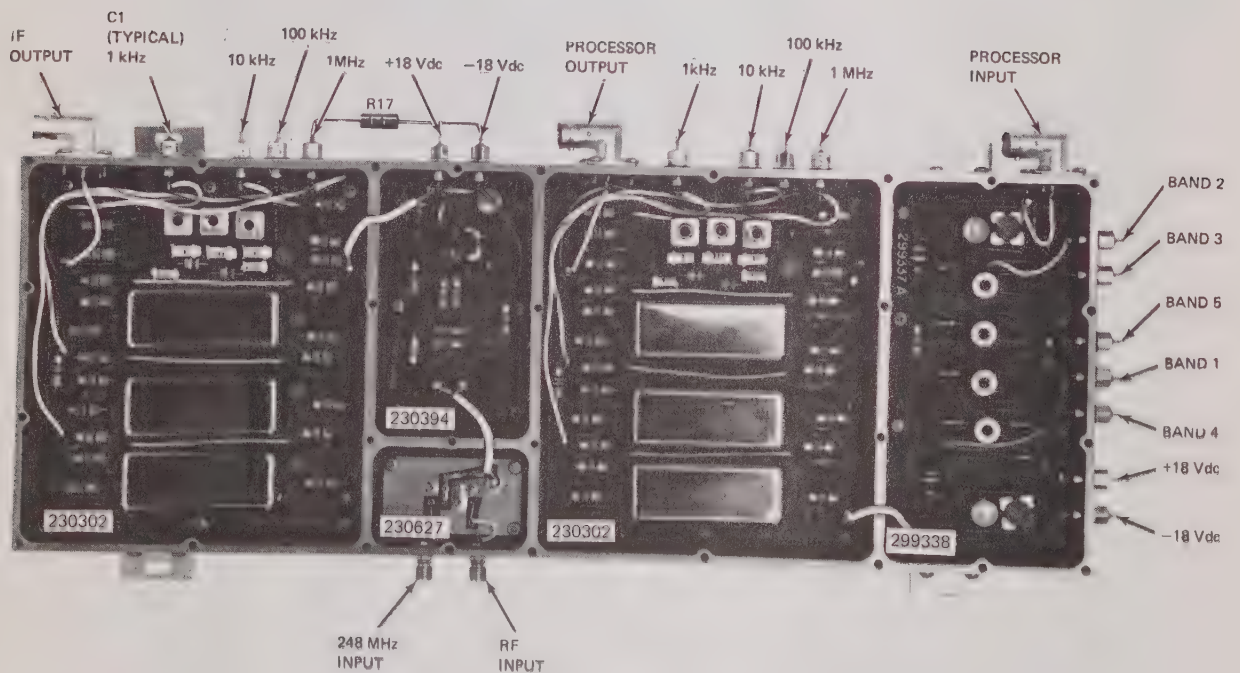
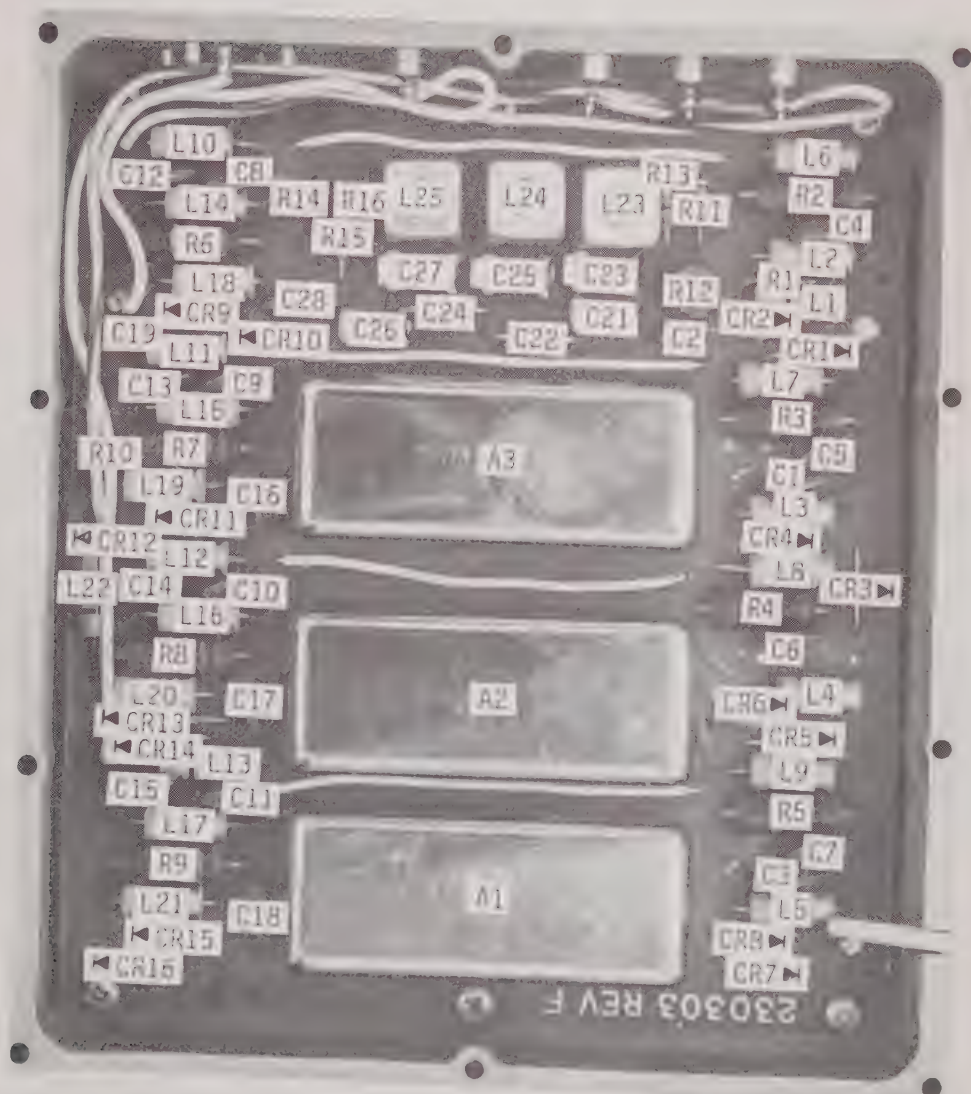
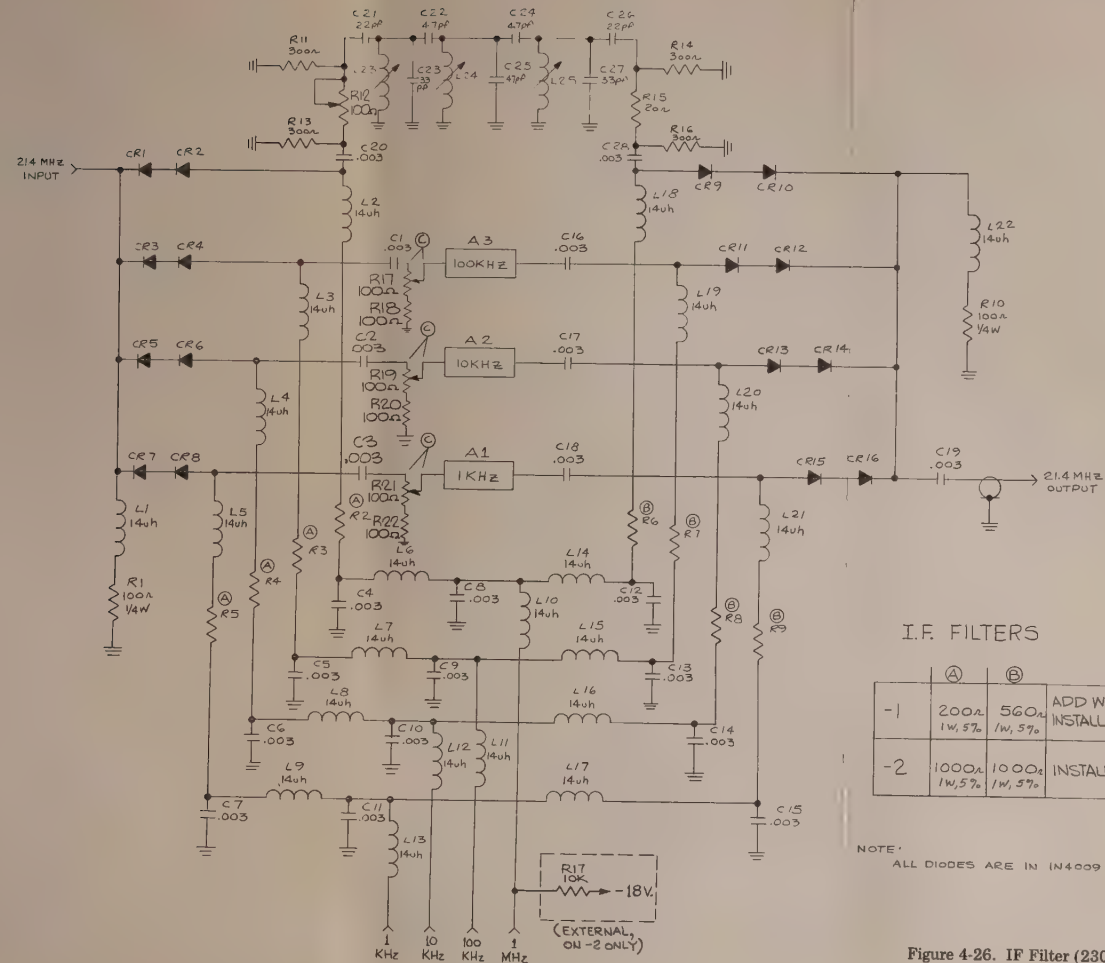


Figure 4-25. IF Assembly (299350)

IF ASSEMBLY (299350)

<u>Item</u>	<u>Description</u>	<u>FMC</u>	<u>Part No.</u>
C1 thru C17	Capacitor, filter	50056	MF204
R17	Resistor, 10 k, 1/4 W	81349	RC07GF103J
	Filter Board	00752	230302-1
	Filter Board	00752	230302-2
	Processor Board	00752	299338
	IF Amplifier Board	00752	230394
	Mixer Board	00752	230627





I.F. FILTERS

	(A)	(B)	(C)
-1	200Ω 1W, 5%	560Ω 1W, 5%	ADD WIRE JUMPER. DONOT INSTALL R17 THRU R22
-2	1000Ω 1W, 5%	1000Ω 1W, 5%	INSTALL R17 THRU R22

NOTE:
ALL DIODES ARE IN 1N4009

Figure 4-26. IF Filter (230302) (Sheet 2 of 2)

IF FILTER BOARD (230302)

<u>Item</u>	<u>Description</u>	<u>FMC</u>	<u>Part No.</u>
A1	Crystal filter	00752	231012-1
A2	Crystal filter	00752	231012-2
A3	Crystal filter	00752	231012-3
C1 thru C20	Capacitor, 3000 pF	71590	DD-302
C21	Capacitor, 22 pF	72982	301-000-COGO-220G
C22	Capacitor, 4.7 pF	78488	Stackpole GA
C23	Capacitor, 33 pF	72982	308-000-COGO-330G
C24	Capacitor, 4.7 pF	78488	Stackpole GA
C25	Capacitor, 47 pF	72982	308-000-COGO-470G
C26	Capacitor, 22 pF	72982	301-000-COGO-220G
C27	Capacitor, 33 pF	72982	308-000-COGO-330G
C28	Capacitor, 3000 pF	72982	DD-302
CR1 thru CR16	Diode	03508	1N4009
L1 thru L22	Inductor, 14 μ H	00752	115297-2
L23 thru L25	Inductor, variable	04213	435-3
R1	Resistor, 100, 1/4 W	81349	RC07GF101J
R2 thru R5	Resistor, 200, 1 W, 5%	81349	RC32GF201J
R6 thru R9	Resistor, 560, 1 W, 5%	81349	RC32GF561J
R10	Resistor, 100, 1/4 W	81349	RC07GF101J
R11	Resistor, 300, 1/4 W	81349	RC07GF301J
R12	Resistor, variable, 100	80294	3339P-1-101
R13, R14	Resistor, 300, 1/4 W	81349	RC07GF301J
R15	Resistor, 20, 1/4 W	81349	RC07GF200J
R16	Resistor, 300, 1/4 W	81349	RC07GF301J
R17 (-2)	Resistor, variable, 100	80294	3339P-1-101
R18 (-2)	Resistor, 100, 1/4 W	81349	RC07GF101J
R19 (-2)	Resistor, variable, 100	80294	3339P-1-101
R20 (-2)	Resistor, 100, 1/4 W	81349	RC07GF101J
R21 (-2)	Resistor, variable, 100	80294	3339P-1-101
R22 (-2)	Resistor, 100, 1/4 W		RC07GF101J

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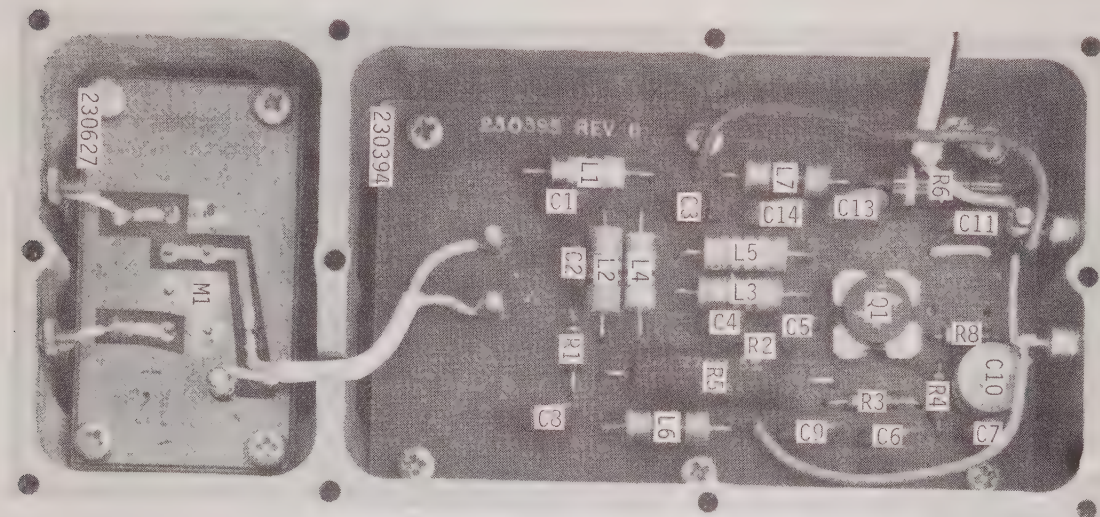


Figure 4-27. IF Amplifier (230394) (Sheet 1 of 2)

IF AMPLIFIER BOARD (230394)

<u>Item</u>	<u>Description</u>	<u>FMC</u>	<u>Part No.</u>
C1, C2	Capacitor, 100 pF	71590	DD-101
C3	Capacitor, 220 pF	71590	CK05CW221K
C4, C5	Capacitor, 100 pF	71590	DD-101
C6 thru C9	Capacitor, 0.003 μ F	71590	DD-302
C10	Capacitor, variable 15-60 pF	81349	538-011-F-15-60
C11	Capacitor, 0.003 μ F	71590	DD-302
C12	Not used		
C13, C14	Capacitor, 0.003 μ F	71590	DD-302
L1	Inductor, 0.15 μ H	71895	1537-00
L2, L3	Inductor, 0.25 μ H	97469	115297-1
L4	Inductor, 0.15 μ H	71895	1537-00
L5	Inductor, 3 μ H	97469	115297-4
L6, L7	Inductor, 14 μ H	97469	115297-2
Q1	Transistor	00752	230541-1
R1, R2	Resistor, 51, 1/4 W	81349	RC07GF510J
R3, R4	Resistor, 20, 1/4 W	81349	RC07GF200J
R5	Resistor, 270, 5 W, 5%	09969	RS-5, 270, 5%
R6	Resistor, 39, 1 W	81349	RC32GF101J
R7	Not used		
R8	Resistor, 47, 1/4 W	81349	RC07GF470J

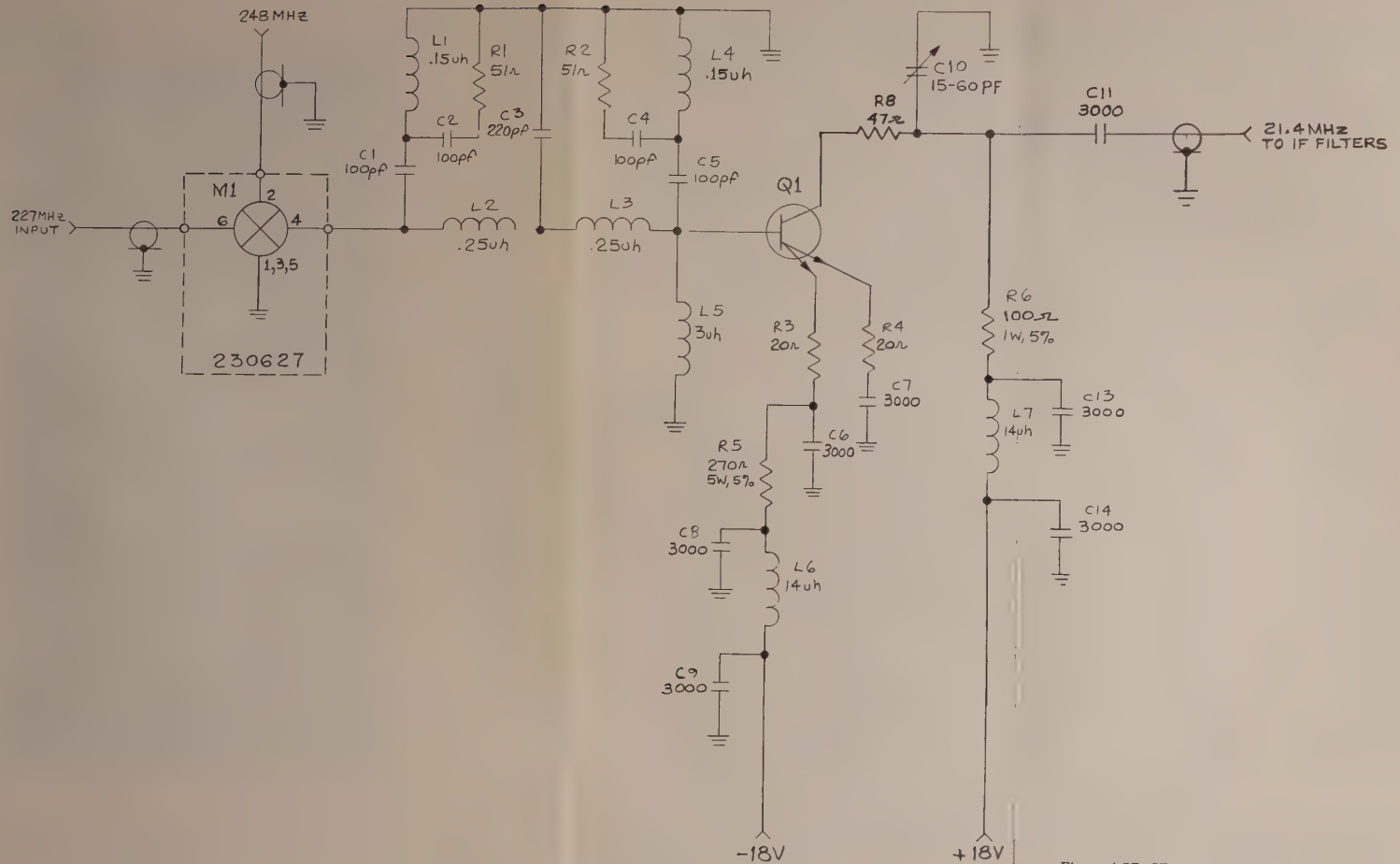


Figure 4-27. IF Amplifier (230394) (Sheet 2 of 2)

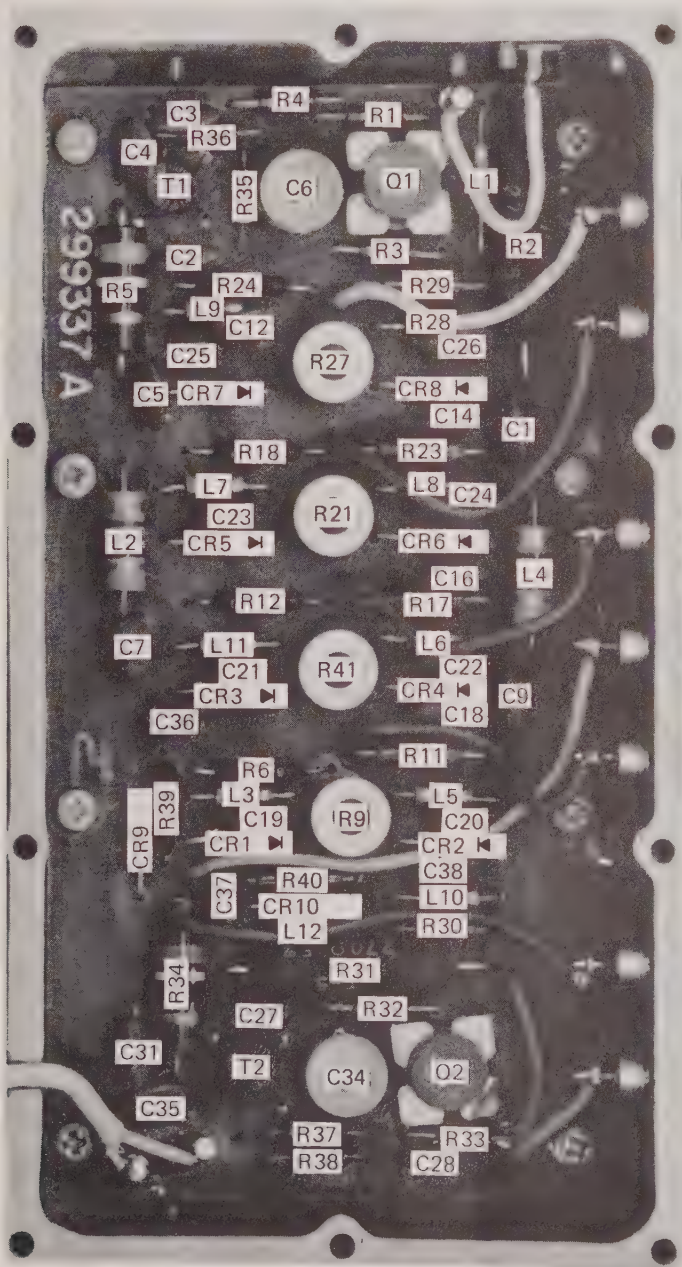


Figure 4-28. IF Processor (299335) (Sheet 1 of 2)

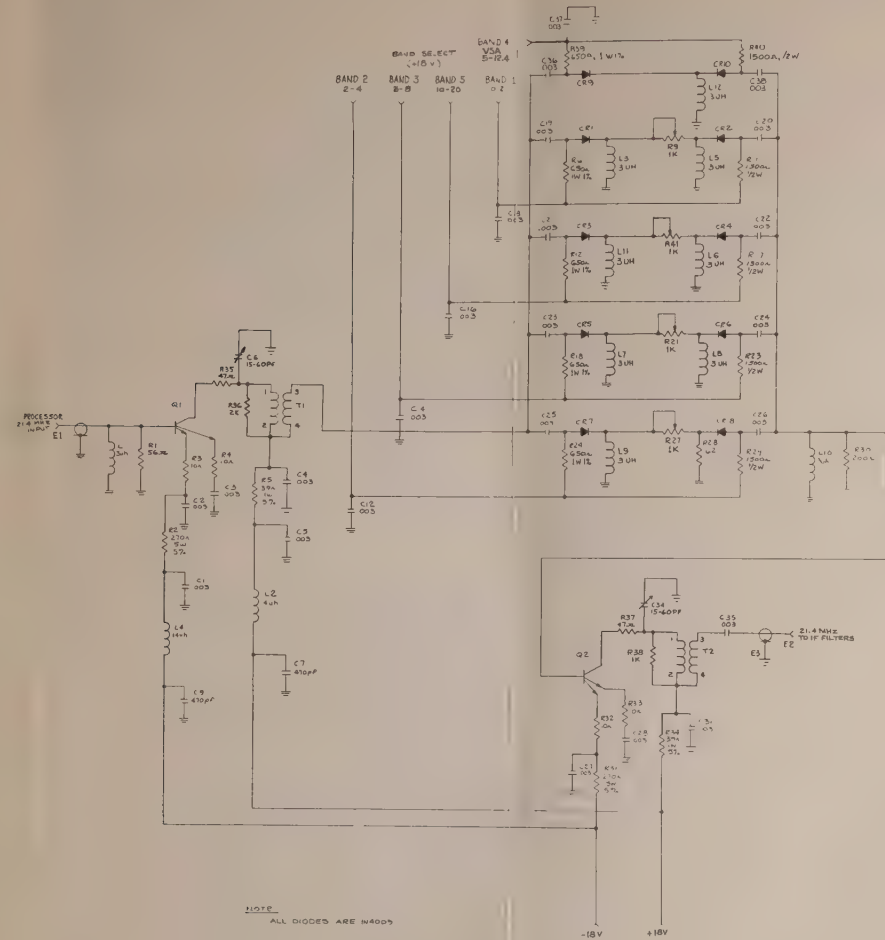


Figure 4-28. IF Processor (299335) (Sheet 2 of 2)

IF PROCESSOR BOARD (299335)

<u>Item</u>	<u>Description</u>	<u>FMC</u>	<u>Part No.</u>
C1 thru C5	Capacitor, 3000 pF	71590	DD-302
C6	Capacitor, variable, 15-60 pF	72982	538-011-F15-60
C7	Capacitor, 470 pF	81349	CK60AX471K
C8	Not used		
C9	Capacitor, 470 pF	81349	CK60AX471K
C10, C11	Not used		
C12	Capacitor, 3000 pF	71590	DD-302
C13	Not used		
C14	Capacitor, 3000 pF	71590	DD-302
C15	Not used		
C16	Capacitor, 3000 pF	71590	DD-302
C17	Not used		
C18 thru C28	Capacitor, 3000 pF	71590	DD-302
C29, C30	Not used		
C31	Capacitor, 3000 pF	71590	DD-302
C32, C33	Not used		
C34	Capacitor, variable, 15-60 pF	72982	538-011-F15-60
C35 thru C38	Capacitor, 3000 pF	71590	DD-302
CR1 thru CR10	Diode	03508	1N4009
L1	Inductor, 3.3 μ H	71895	1025-32
L2	Inductor, 14 μ H	00752	115297-2
L3	Inductor, 3.3 μ H	71895	1025-32
L4	Inductor, 14 μ H	00752	115297-2
L5 thru L12	Inductor, 3.3 μ H	71895	1025-32
Q1, Q2	Transistor	00752	230541-1
R1	Resistor, 56, 1/4 W	81349	RC07GF560J
R2	Resistor, 270, 5 W, 5%	09969	RS-5
R3, R4	Resistor, 10, 1/4 W	81349	RC07GF100J
R5	Resistor, 39, 1 W, 5%	81349	RC32GF390J
R6	Resistor, 650, 1%, 1 W	09969	RS-1A
R7, R8	Not used		
R9	Resistor, variable, 1 k	01121	SV1021
R10	Not used		
R11	Resistor, 1.5 k, 1/2 W	81349	RC20GF152J
R12	Resistor, 650, 1%, 1 W	09969	RS-1A
R13 thru R16	Not used		
R17	Resistor, 1.5 k, 1/2 W	81349	RC20GF152J
R18	Resistor, 650, 1%, 1 W	09969	RS-1A
R19, R20	Not used		
R21	Resistor, variable, 1 k	01121	SV1021
R22	Not used		
R23	Resistor, 1.5 k, 1/2 W	81349	RC20GF152J
R24	Resistor, 650, 1%, 1 W	09969	RS-1A
R25	Not used		
R26	Not used		

IF PROCESSOR BOARD (299335) (cont)

<u>Item</u>	<u>Description</u>	<u>FMC</u>	<u>Part No.</u>
R27	Resistor, variable, 1 k	01121	SV1021
R28	Resistor, 62, 1/4 W	81349	RC07GF620J
R29	Resistor, 1.5 k, 1/2 W	81349	RC20GF152J
R30	Resistor, 200, 1/4 W	81349	RC07GF201J
R31	Resistor, 270, 5 W, 5%	09969	RS-5
R32, R33	Resistor, 10, 1/4 W	81349	RC07GF100J
R34	Resistor, 39, 1 W, 5%	81349	RC32GF390J
R35	Resistor, 47, 1/4 W	81349	RC07GF470J
R36	Resistor, 2 k, 1/4 W	81349	RC07GF202J
R37	Resistor, 47, 1/4 W	81349	RC07GF470J
R38	Resistor, 1 k, 1/4 W	81349	RC07GF102J
R39	Resistor, 650, 1%, 1 W	09969	RS-1A
R40	Resistor, 1.5 k, 1/2 W	81349	RC20GF152J
R41	Resistor, variable, 1 k	01121	SV1021
T1, T2	Transformer	00752	230531-3

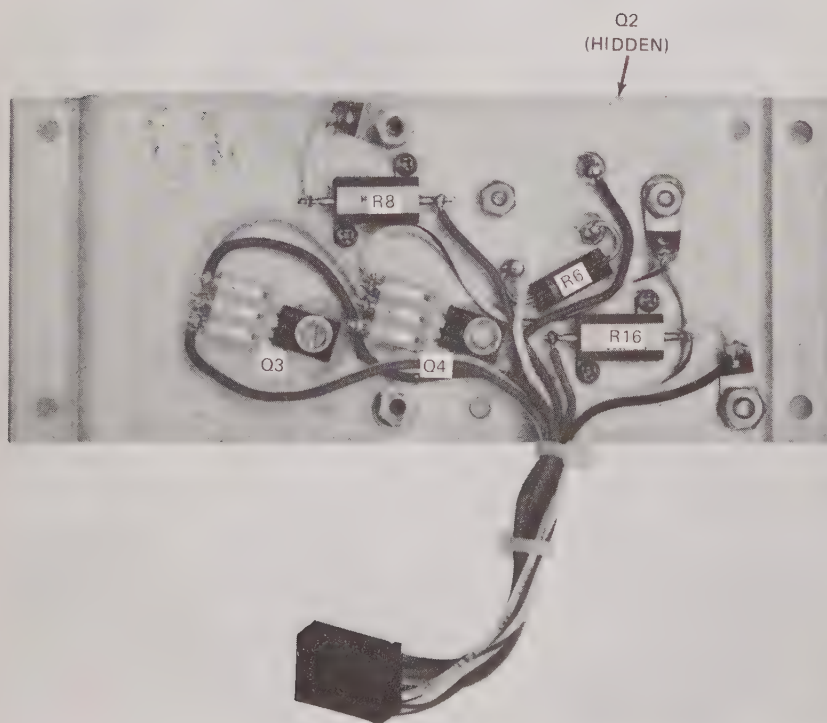
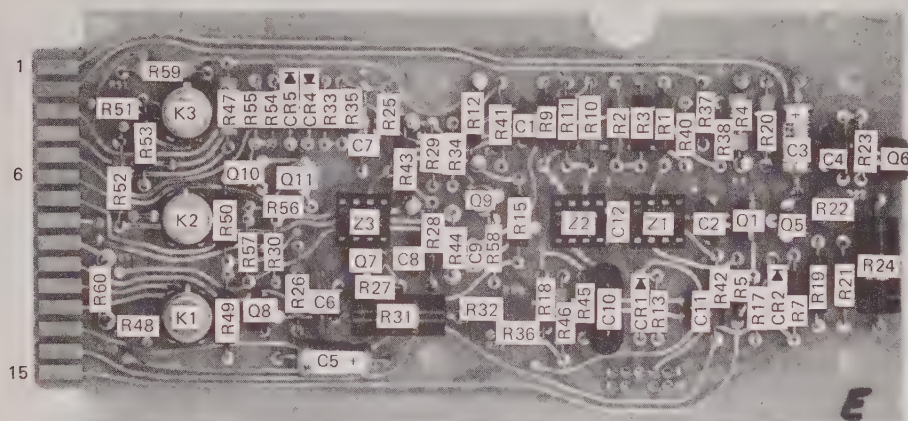


Figure 4-29. YIG Driver J18 Board (299400) (Sheet 1 of 2)

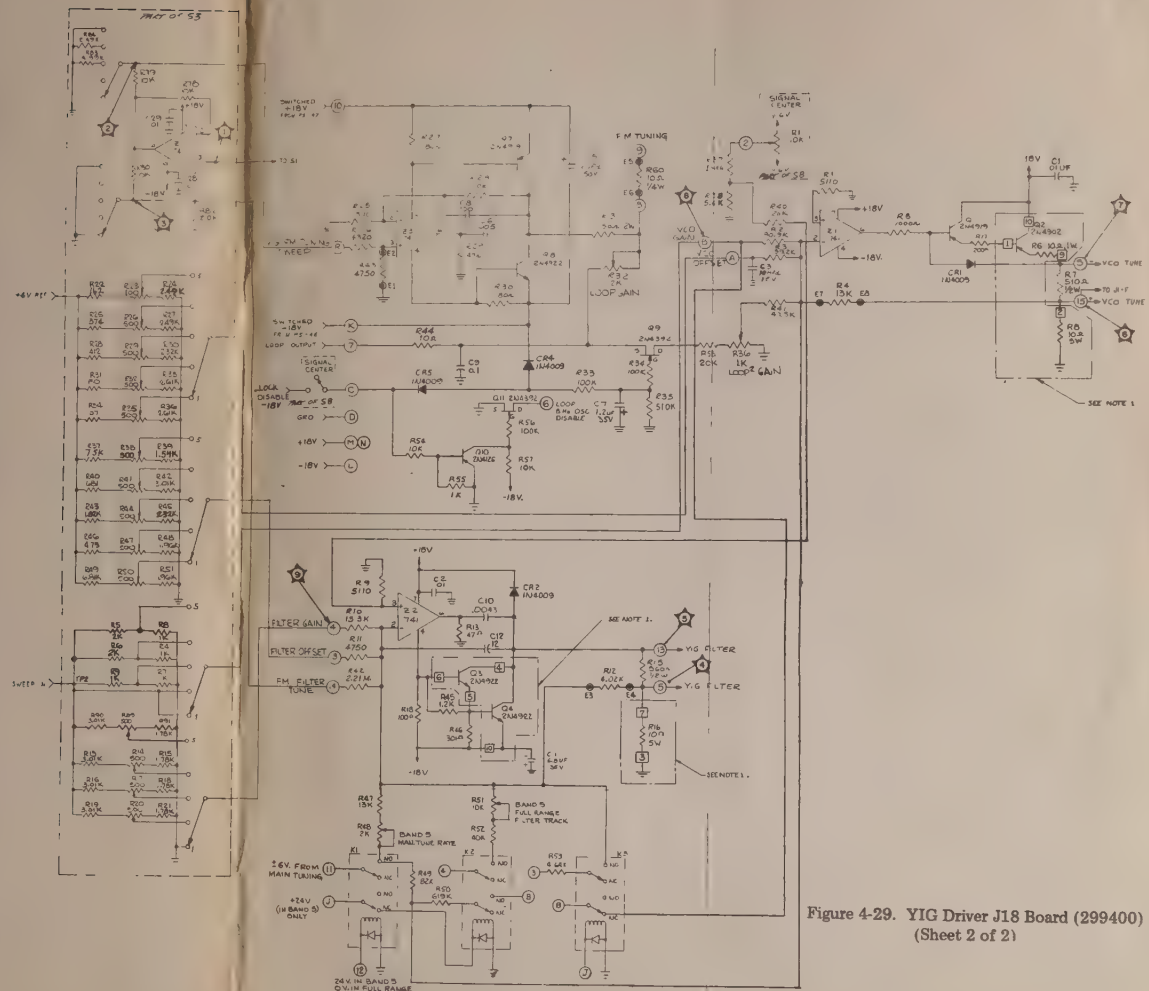


Figure 4-29. YIG Driver J18 Board (299400)
(Sheet 2 of 2)

YIG DRIVERS ASSEMBLY (299400)

<u>Item</u>	<u>Description</u>	<u>FMC</u>	<u>Part No.</u>
Q2	Transistor	04713	2N4902
Q4	Transistor	04713	2N4902
R6	Resistor, 10, 1 W	81349	RC32GF100J
R8	Resistor, 10, 5 W, 1%	09969	RE60G10R1
R16	Resistor, 10, 5 W, 1%	09969	RE60G10R1
	YIG Drivers Board	00752	299375

YIG DRIVER J18 BOARD (299400)

<u>Item</u>	<u>Description</u>	<u>FMC</u>	<u>Part No.</u>
C1, C2	Capacitor, 0.01 μ F	56289	5HKS-S10
C3	Capacitor, 10 μ F, 12 V	56289	TE-1128
C4	Not used		
C5	Capacitor, 2 μ F, 50 V	56289	TE-1301
C6	Capacitor, 0.005 μ F	71590	DD-502
C7	Capacitor, 1.2 μ F, 20 V	56289	CS13BE125K
C8	Capacitor, 100 pF	72136	DM5-101-J
C9	Capacitor, 0.1 μ F	72982	8121-050-651-1C41
C10	Capacitor, 4300 pF		CM06FD432J03
C11	Capacitor, 6.8 μ F, 35 V	05397	T368B685M035AS
C12	Capacitor, 12 pF	00752	299241-120
CR1, CR2	Diode	03508	1N4009
CR3	Not used		
CR4, CR5	Diode	03508	1N4009
**K1 thru K3	Relay, double pole, double throw		712DM-26 Teledyne
Q1-Q7	Transistor	04713	2N4922
Q8	Transistor		2N4922
Q9	Transistor	04713	2N4392
Q10	Transistor	49956	2N4126
Q11	Transistor	04713	2N4392
R1	Resistor, 5.11 k, 1/8 W	81349	RN60C5111F
R2	Resistor, 90.9 k, 1/8 W	81349	RN60C9092F
R3	Resistor, 39.2 k, 1/8 W	81349	RN60C3922F
R4	Resistor, 13.0 k, 1/8 W	81349	RN60C1302F
R5	Resistor, 1 k, 1/4 W	81349	RC07GF102J
R6	Not used		
R7	Resistor, 510, 1/2 W	81349	RC20GF511J
R8	Not used		
R9	Resistor, 5.11 k, 1/8 W	81349	RN60C5111F
R10	Resistor, 13.3 k, 1/8 W	81349	RN60C1332F
R11	Resistor, 4.75 k, 1/8 W	81349	RN60C4751F
R12	Resistor, 4.02 k, 1/8 W	81349	RN60C4021F

**Parts used only on 299395-1 board.

YIG DRIVER J18 BOARD (299400) (cont)

<u>Item</u>	<u>Description</u>	<u>FMC</u>	<u>Part No.</u>
R13	Resistor, 47, 1/4 W	81349	RC07GF470J
R14	Not Used		
R15	Resistor, 560, 1/2 W	81349	RC20GF561J
R16	Not used		
R17	Resistor, 200, 1/4 W	81349	RC07GF201J
R18	Resistor, 100, 1/4 W	81349	RC07GF101J
R19 thru R24	Not used		
R25	Resistor, 5.11,k, 1/8 W	81349	RN60C5111F
R26	Resistor, 4.32 k, 1/8 W	81349	RN60C4321F
R27	Resistor, 180, 1/4 W	81349	RC07GF181J
R28	Resistor, 10 k, 1/8 W	81349	RN60C1002F
R29	Resistor, 47, 1/4 W	81349	RC07GF470J
R30	Resistor, 180, 1/4 W	81349	RC07GF181J
R31	Resistor, 150, 2 W	81349	RC42GF151J
R32	Resistor, variable, 2 k	80294	3279W-1-202
R33	Resistor, 100 k, 1/4 W	81349	RC07GF104J
R34	Resistor, 100 k, 1/4 W	81349	RC07GF104J
R35	Resistor, 510 k, 1/4 W	81349	RC07GF514J
R36	Resistor, variable, 1 k	80294	3279W-1-102
R37	Resistor, 1 meg, 1/4 W	81349	RC07GF105J
R38	Resistor, 5.6 k, 1/4 W	81349	RC07GF562J
R39	Not used		
R40	Resistor, 20 k, 1/4 W	81349	RC07GF203J
R41	Resistor, 47.5 k, 1/8 W	81349	RN60C4752F
R42	Resistor, 2.21 meg, 1/8 W	81349	RN60C2214F
R43	Resistor, 4.75* k, 1/8 W	81349	RN60C4751F
R44	Resistor, 10, 1/4 W	81349	RC07GF100J
R45	Resistor, 1.2 k, 1/4 W	81349	RC07GF122J
R46	Resistor, 301, 1/8 W	81349	RN60C3010F
**R47	Resistor, 13 k, 1/8 W	81349	RN60C1302F
**R48	Resistor, variable, 2 k	80294	3279W-1-202
**R49	Resistor, 182 k, 1/8 W	81349	RN60C1823F
**R50	Resistor, 619 k, 1/8 W	81349	RN60C6193F
**R51	Resistor, variable, 10 k	80294	3279W-1-103
**R52	Resistor, 40 k, 1/8 W	81349	RN60C4002F
**R53	Resistor, 4.64 k, 1/8 W	81349	RN60C4641F
R54	Resistor, 10 k, 1/4 W	81349	RC07GF103J
R55	Resistor, 1 k, 1/4 W	81349	RC07GF102J
R56	Resistor, 100 k, 1/4 W	81349	RC07GF104J
R57	Resistor, 10 k, 1/4 W	81349	RC07GF103J
R58	Resistor, 20 k, 1/4 W	81349	RC07GF203J
**R59	Resistor, 61.9 k, 1/8 W	81349	RN60C6192F
R60	Resistor, 10, 1/4 W	81349	RC07GF100J
Z1 thru Z3	Integrated Circuit	01295	SN72741P

*Resistor value selected at test during manufacture.

**Parts used only on 299395-1 board.

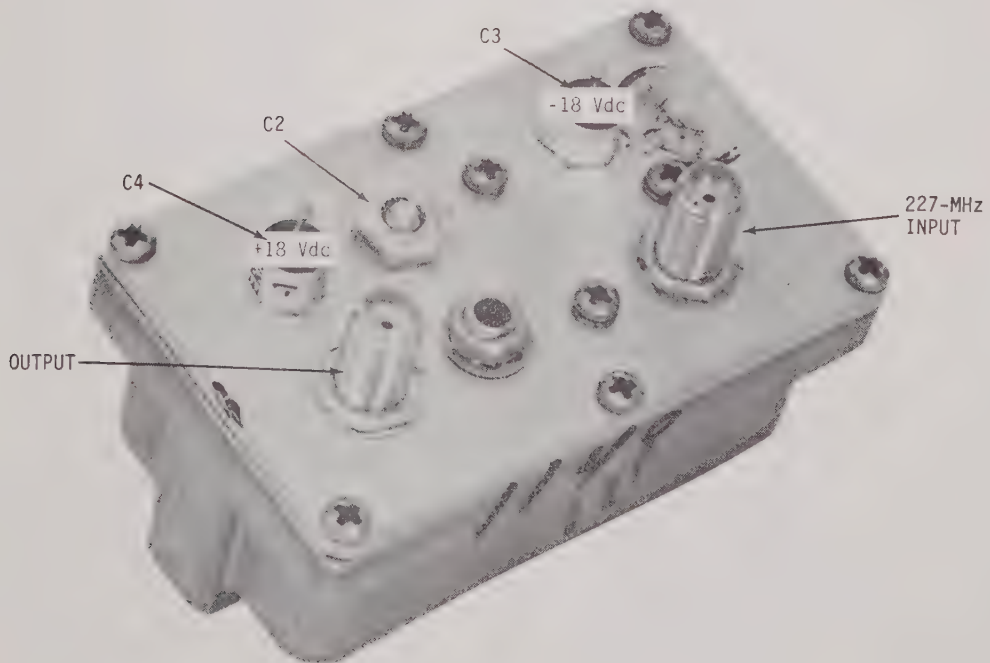
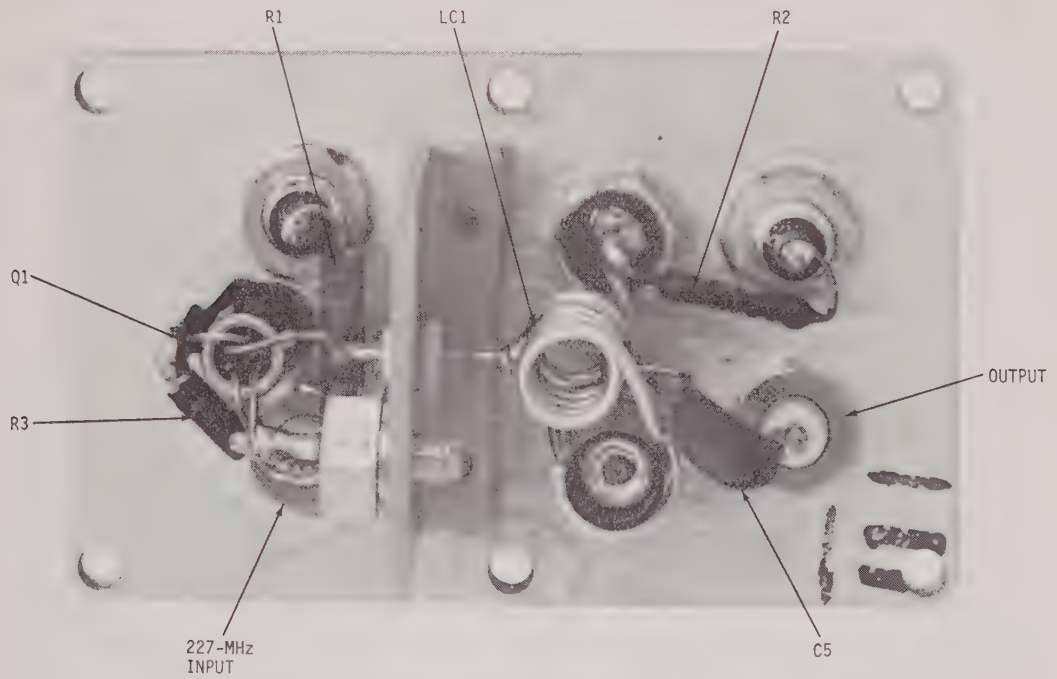


Figure 4-30. RF Amplifier (230625) (Sheet 1 of 2)

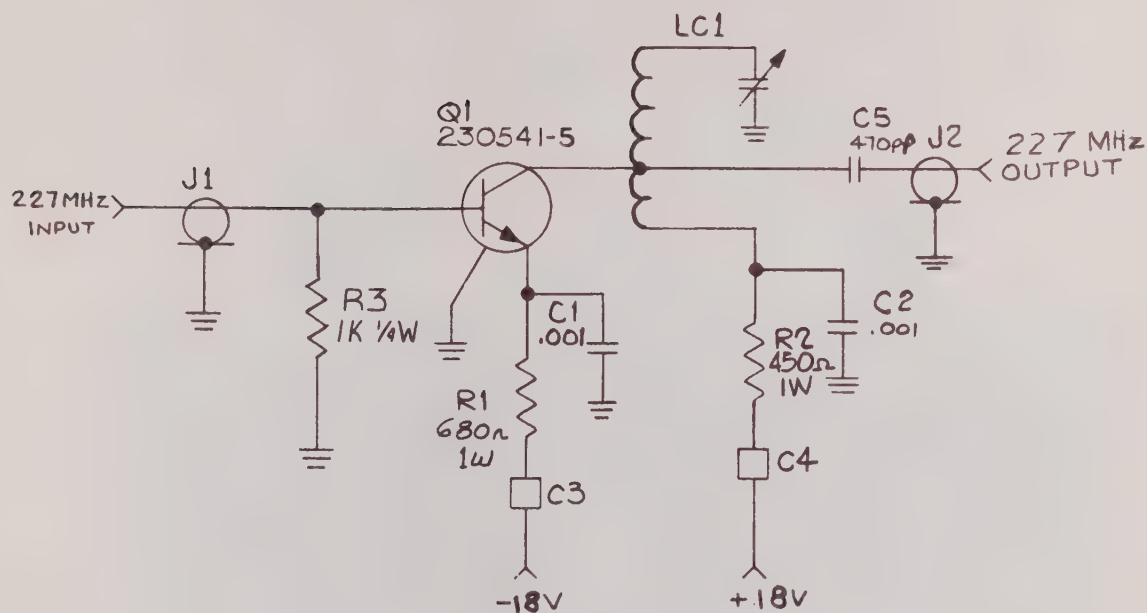


Figure 4-30. RF Amplifier (230625) (Sheet 2 of 2)

RF AMPLIFIER ASSEMBLY (230625)

<u>Item</u>	<u>Description</u>	<u>FMC</u>	<u>Part No.</u>
C1, C2	Capacitor, standoff, 1000 pF	00752	208674-2
C3, C4	Capacitor, filter	50056	MF204
C5	Capacitor, disc, 470 pF	81349	CK60AX471K.
L1	Not used		
LC1	Tank circuit	73899	LC-374
Q1	Transistor	00752	230541-5
R1	Resistor, 680, 1 W, $\pm 5\%$	09969	RS-1A
R2	Resistor, 450, 1 W, $\pm 5\%$	09969	RS-1A
R3	Resistor, 1 k, 1/4 W	81349	RC07GF102J

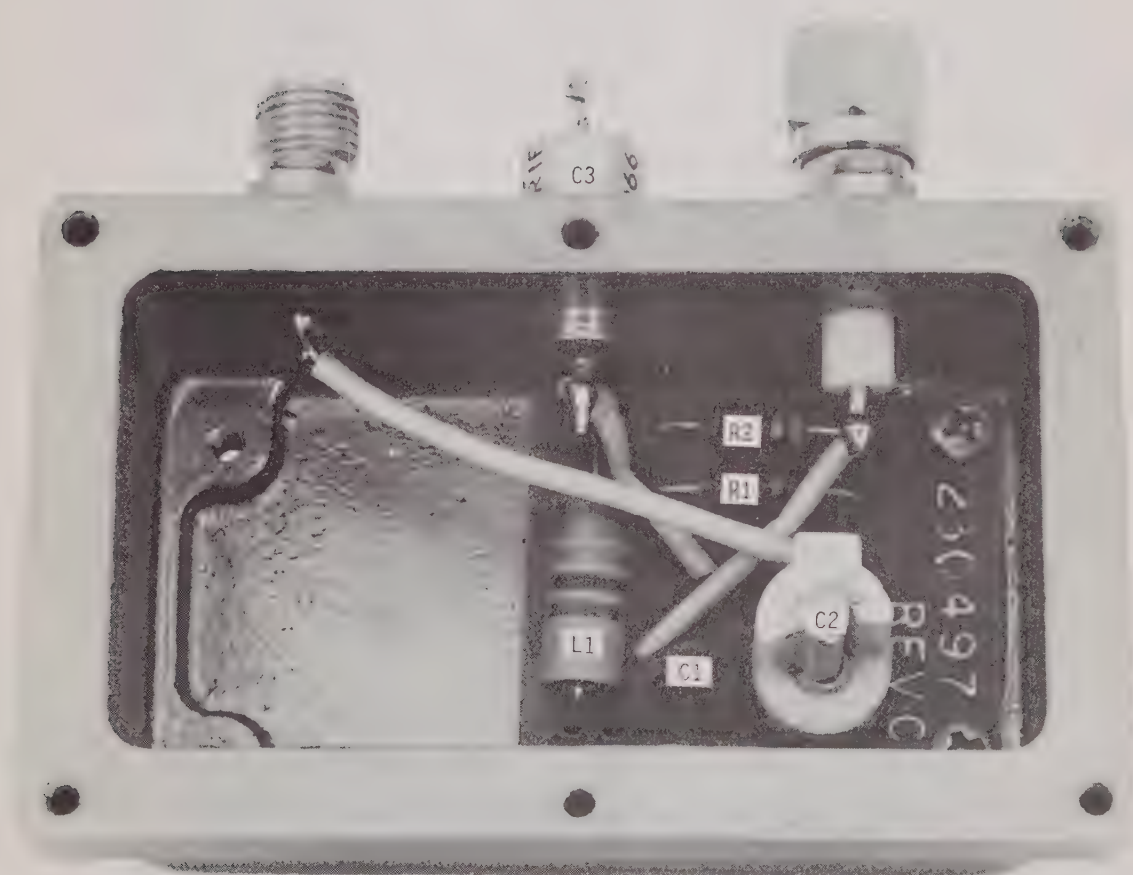


Figure 4-31. Mixer Bias (230500) (Sheet 1 of 2)

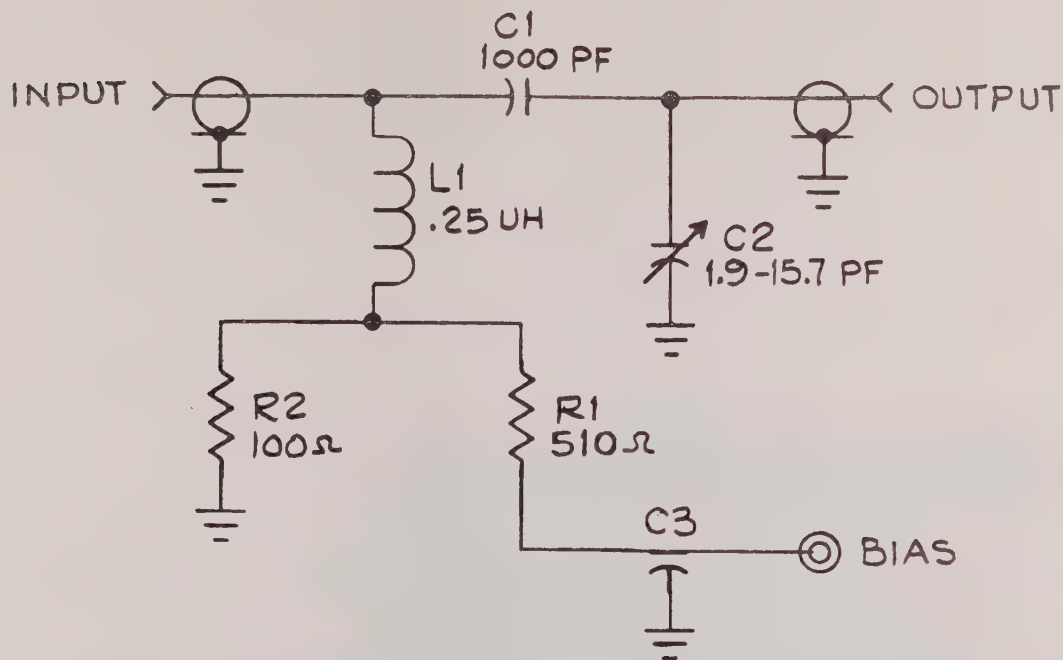


Figure 4-31. Mixer Bias (230500) (Sheet 2 of 2)

MIXER BIAS (230500)

<u>Item</u>	<u>Description</u>	<u>FMC</u>	<u>Part No.</u>
C1	Capacitor, 1000 pF	81349	CK60AW102M
C2	Capacitor, variable 1.9-15.7 pF	74970	187-0109-5
C3	Capacitor, filter	50059	MF204
L1	Inductor, 0.25 μ F	00752	115297-1
R1	Resistor, 510, 1/4 W	81349	RC07GF511J
R2	Resistor, 100, 1/4 W	81349	RC07GF101J

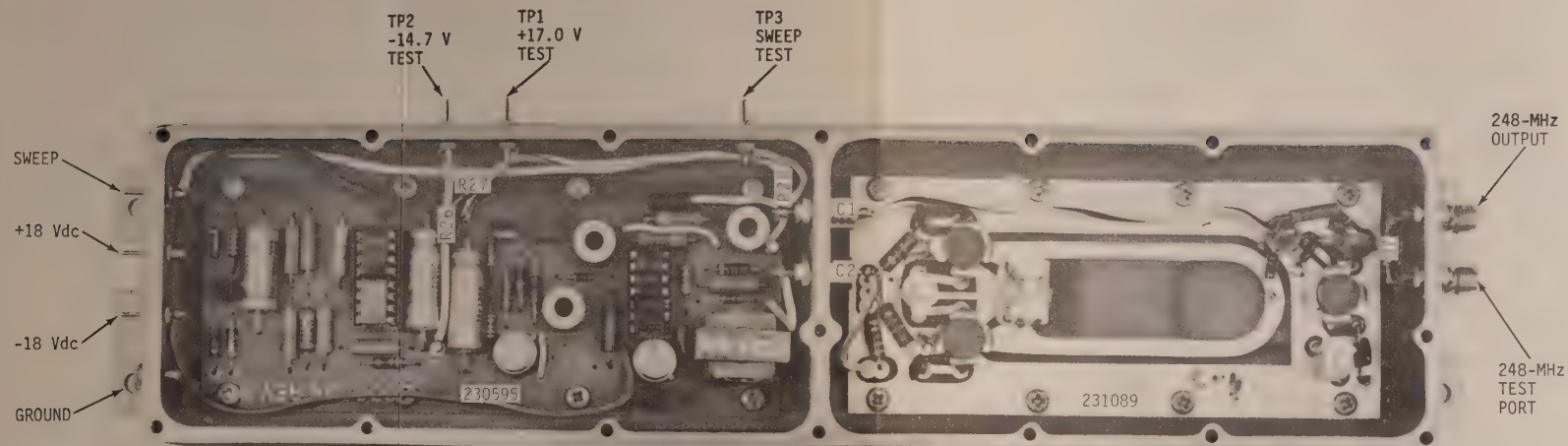


Figure 4-32. LCVCO Assembly (230543)

LCVCO ASSEMBLY (230543)

<u>Item</u>	<u>Description</u>	<u>FMC</u>	<u>Part No.</u>
C1, C2	Capacitor, filter	50056	MF204
R7	Resistor, 1 k, 1/4 W	81349	RC07GF102J
R26 thru R28	Resistor, 1 k, 1/4 W	81349	RC07GF102J
	VCO Osc. II Board	00752	231089
	VCO Shaper Board	00752	230595

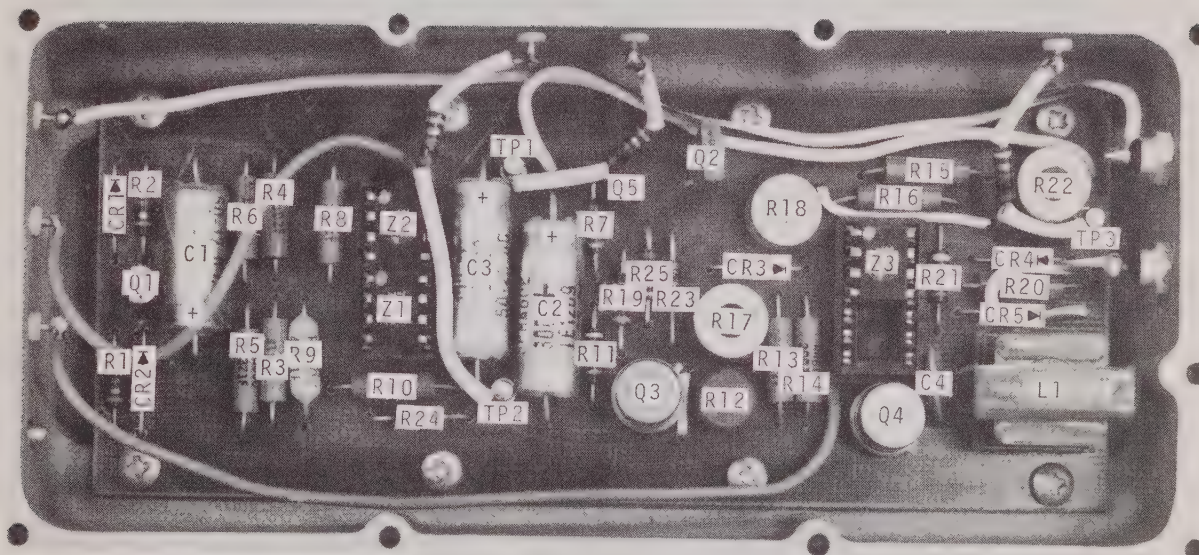


Figure 4-33. LCVCO Shaper Board (230595) (Sheet 1 of 2)

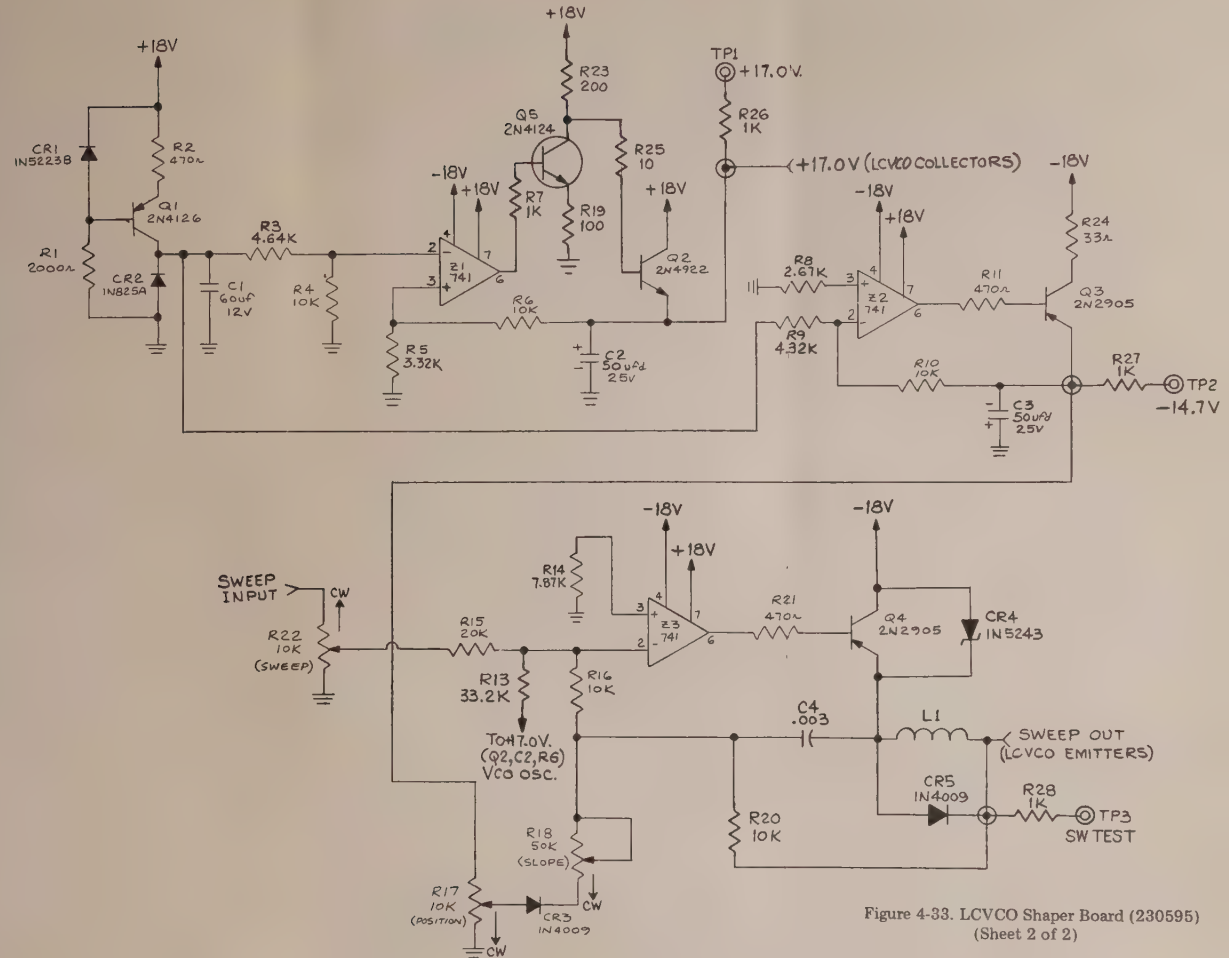


Figure 4-33. LCVCO Shaper Board (230595)
(Sheet 2 of 2)

LCVCO Shaper Board (230595)

<u>Item</u>	<u>Description</u>	<u>FMC</u>	<u>Part No.</u>
C1	Capacitor, 60 μ Fd, 12 V	56289	TE-1133.5
C2, C3	Capacitor, 50 μ F, 25 V	56289	TE-1209
C4	Capacitor, 0.003 μ F	71590	DD-302
CR1	Diode	03508	1N5223B
CR2	Diode	05245	1N825A
CR3	Diode	03508	1N4009
CR4	Diode	03508	1N5243
CR5	Diode	03508	1N4009
L1	Inductor	00752	E2409
Q1	Transistor	49956	2N4126
Q2	Transistor	49956	2N4992
Q3, Q4	Transistor	01295	2N2905
Q5	Transistor	04713	2N4124
R1	Resistor, 2 k, 1/4 W	81349	RC07GF202J
R2	Resistor, 470, 1/4 W	81349	RC07GF471J
R3	Resistor, 4.64 k, 1/8 W	81349	RN60C4641F
R4	Resistor, 10 k, 1/8 W	81349	RN60C1002F
R5	Resistor, 3.32 k, 1/8 W	81349	RN60C3321F
R6	Resistor, 10 k, 1/8 W	81349	RN60C1002F
R7	Resistor, 1 k, 1/4 W	81349	RC07GF102J
R8	Resistor, 2.67 k, 1/8 W	81349	RN60C2671F
R9	Resistor, 4.32 k, 1/8 W	81349	RN60C4321F
R10	Resistor, 10 k, 1/8 W	81349	RN60C1002F
R11	Resistor, 470, 1/4 W	81349	RC07GF471J
R12	Resistor, variable, 10 k	80294	3339P-1-103
R13	Resistor, 33.2 k, 1/8 W	81349	RN60C3322F
R14	Resistor, 7.87 k, 1/8 W	81349	RN60C7871F
R15	Resistor, 20 k, 1/8 W	81349	RN60C2002F
R16	Resistor, 10 k, 1/8 W	81349	RN60C1002F
R17	Resistor, variable, 10 k	01121	SV2031
R18	Resistor, variable, 50 k	01121	SV5031
R19	Resistor, 100, 1/4 W	81349	RC07GF101J
R20	Resistor, 10 k, 1/8 W	81349	RN60C1002F
R21	Resistor, 470, 1/4 W	81349	RC07GF471J
R22	Resistor, variable, 10 k	01121	SV1031
R23	Resistor, 200, 1/4 W	81349	RC07GF201J
R24	Resistor, 33, 1/4 W	81349	RC07GF330J
R25	Resistor, 10, 1/4 W	81349	RC07GF100J
Z1 thru Z3	IC	01298	SN72741P

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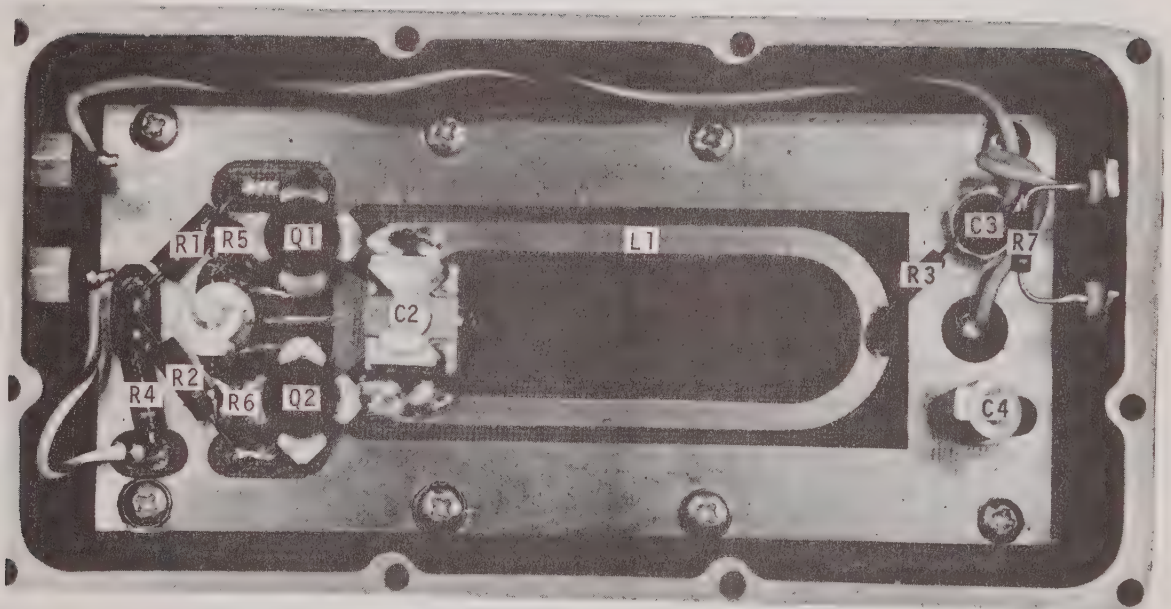


Figure 4-34. LCVCO Oscillator II Board (231089) (Sheet 1 of 2)

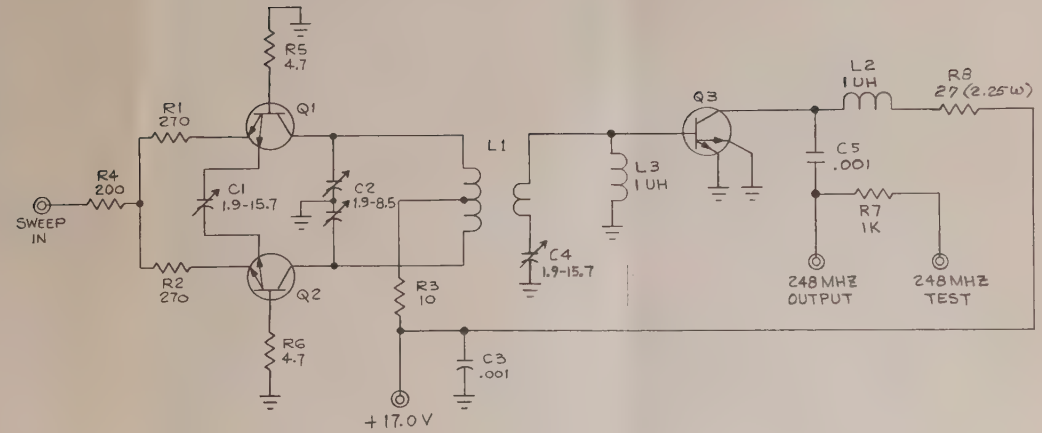


Figure 4-34. LCVCO Oscillator II Board (231089) (Sheet 2 of 2)

LCVCO OSCILLATOR II BOARD (231089)

<u>Item</u>	<u>Description</u>	<u>FMC</u>	<u>Part No.</u>
C1	Capacitor, variable, 1.9-15.7 pF	74970	187-0109-5
C2	Capacitor, variable, 1.9-8.5 pF	74970	189-253-5
C3	Capacitor, standoff, 1000 pF	01121	SS5D-102W
C4	Capacitor, variable, 1.9-15.7 pF	74970	187-0109-5
C5	Capacitor, 1000 pF	81349	DD102
L1	Not used		
L2, L3	Inductor, 1 μ H	71895	1025-20
Q1 thru Q3	Transistor	00752	230541-1
R1, R2	Resistor, 270, 1/2 W	81349	RC20GF271J
R3	Resistor, 10, 1/4 W	81349	RC07GF100J
R4	Resistor, 200, 1/2 W	81349	RC20GF201J
R5, R6	Resistor, 4.7, 1/8 W	81349	RC05GF4R7J

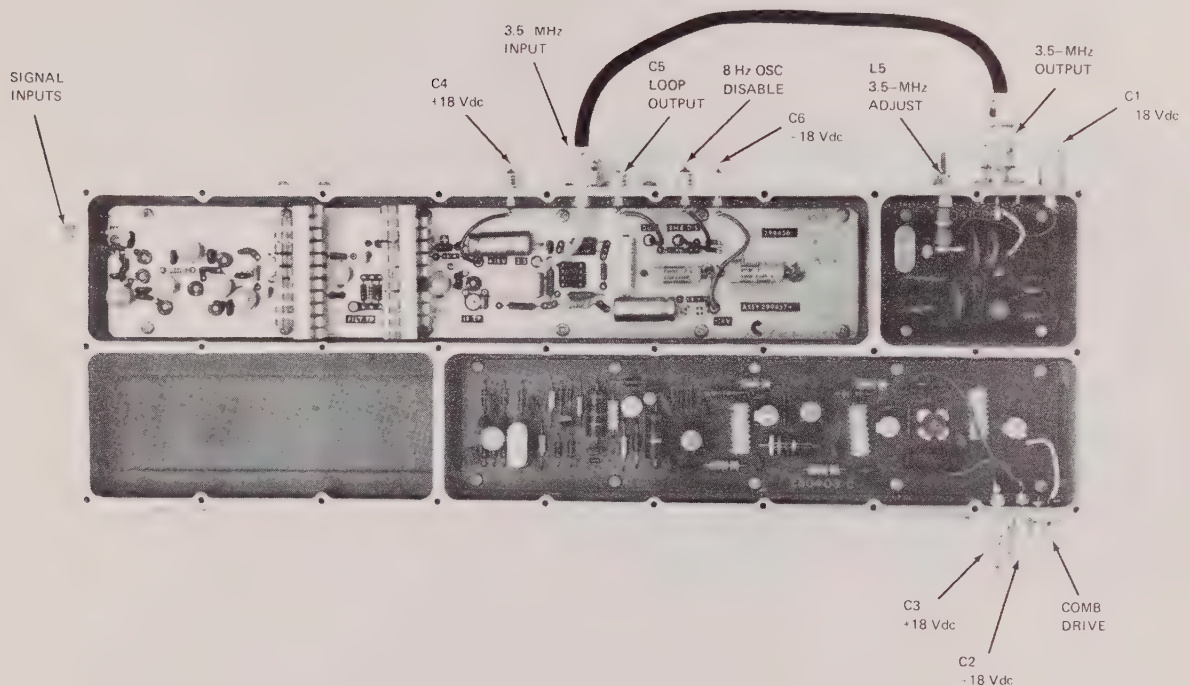


Figure 4-35. Loop Assembly (299375)

LOOP ASSEMBLY (299375)

<u>Item</u>	<u>Description</u>	<u>FMC</u>	<u>Part No.</u>
C1 thru C4	Capacitor, filter	50056	MF204
C5 thru C7	Capacitor, filter	72982	1215-094
L5	Coil, variable, modified	00752	231075
	Comb Source Board	00752	230402
	Loop Control Board	00752	299459
	3.5 MHz Oscillator Board	00752	230410

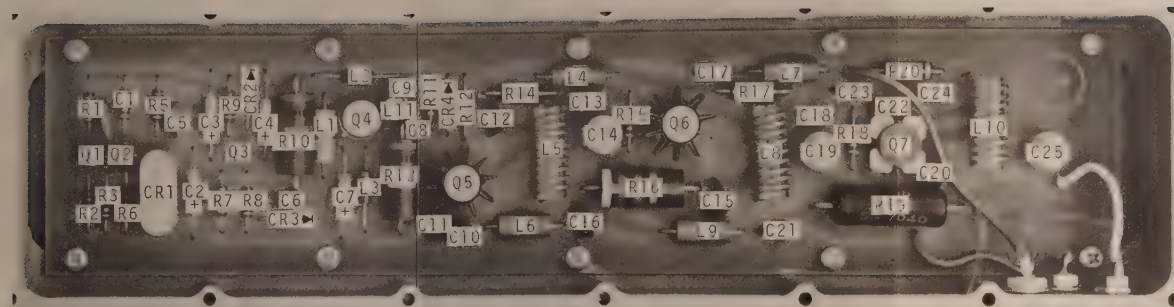


Figure 4-36. Comb Source (230402) (Sheet 1 of 2)

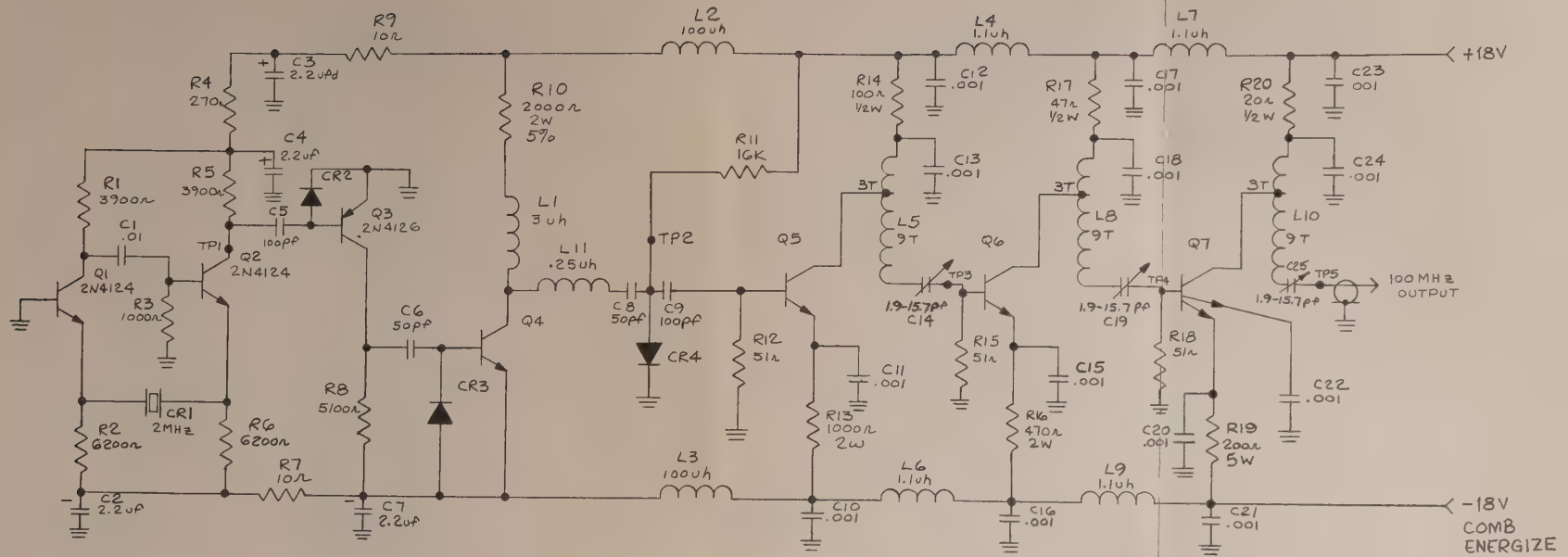


Figure 4-36. Comb Source (230402)
(Sheet 2 of 2)

COMB SOURCE BOARD (230402)

<u>Item</u>	<u>Description</u>	<u>FMC</u>	<u>Part No.</u>
C1	Capacitor, 0.01 μ F	56289	5HKS-S10
C2 thru C4	Capacitor, 2.2 μ F	56289	CS13BD225K
C5	Capacitor, 100 pF	71590	DD-101
C6	Capacitor, 50 pF	71590	DD-500
C7	Capacitor, 2.2 μ F	56289	CS13BE225K
C8	Capacitor, 50 pF	71590	DD-500
C9	Capacitor, 100 pF	71590	DD-101
C10 thru C13	Capacitor, 0.001 μ F		CK60AW102M
C14	Capacitor, variable, 1.9-15.7 pF	74970	187-0109-5
C15 thru C18	Capacitor, 0.001 μ F		CK60AW102M
C19	Capacitor, variable, 1.9-15.7 pF	74970	187-0109-5
C20 thru C24	Capacitor, 0.001 μ F		CK60AW102M
C25	Capacitor, variable, 1.9-15.7 pF	74970	187-0109-5
CR1	Crystal, 2 MHz	00752	230479-3
CR2, CR3	Diode	00752	230542-1
CR4	Diode	00752	230542-2
L1	Inductor, 3 μ H	97469	115297-4
L2, L3	Inductor, 100 μ H	04072	70F104A1
L4	Inductor, 1.1 μ H	97469	115297-3
L5	Inductor, fixed	97469	230529-1
L6, L7	Inductor, 1.1 μ H	97469	115297-3
L8	Inductor, fixed	97469	230529-1
L9	Inductor, 1.1 μ H	97469	115297-3
L10	Inductor, fixed	00752	230529-1
L11	Inductor, 0.25 μ H	00752	115297-1
Q1, Q2	Transistor	04713	2N4124
Q3	Transistor	49956	2N4126
Q4 thru Q6	Transistor	00752	230541-2
Q7	Transistor	00752	230541-1
R1	Resistor, 3.9 k, 1/4 W	81349	RC07GF392J
R2	Resistor, 6.2 k, 1/4 W	81349	RC07GF622J
R3	Resistor, 1 k, 1/4 W	81349	RC07GF102J
R4	Resistor, 270, 1/4 W	81349	RC07GF271J
R5	Resistor, 3.9 k, 1/4 W	81349	RC07GF392J
R6	Resistor, 6.2 k, 1/4 W	81349	RC07GF522J
R7	Resistor, 10, 1/4 W	81349	RC07GF100J
R8	Resistor, 5.1 k, 1/4 W	81349	RC07GF512J
R9	Resistor, 10, 1/4 W	81349	RC07GF100J
R10	Resistor, 2 k, 2 W	81349	RC42GF202J
R11	Resistor, 16 k, 1/4 W	81349	RC07GF163J
R12	Resistor, 51, 1/4 W	81349	RC07GF510J
R13	Resistor, 1 k, 2 W	81349	RC42GF102J
R14	Resistor, 100, 1/2 W	81349	RC20GF101J

COMB SOURCE BOARD (230402) (cont)

<u>Item</u>	<u>Description</u>	<u>FMC</u>	<u>Part No.</u>
R15	Resistor, 51, 1/4 W	81349	RC07GF510J
R16	Resistor, 470, 2 W	81349	RC42GF471J
R17	Resistor, 47, 1/2 W	81349	RC20GF470J
R18	Resistor, 51, 1/4 W	81349	RC07GF510J
R19	Resistor, 200, 5 W, 5%	09969	RS-5
R20	Resistor, 20, 1/2 W	81349	RC20GF200J

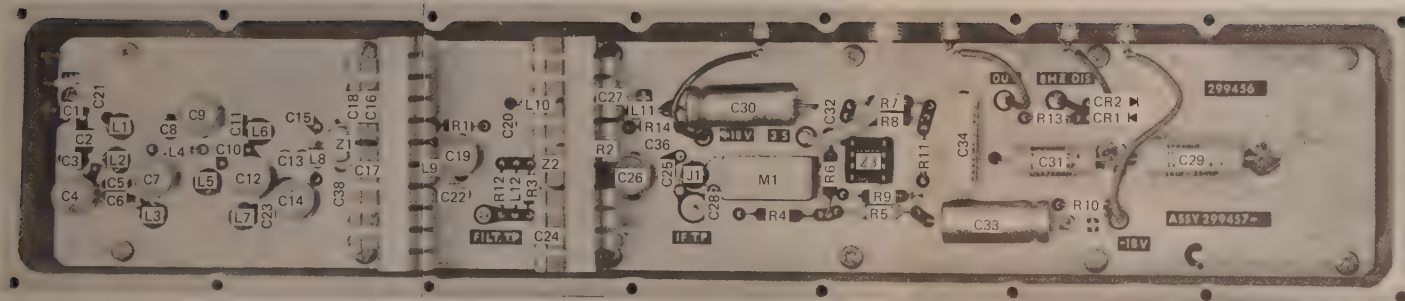
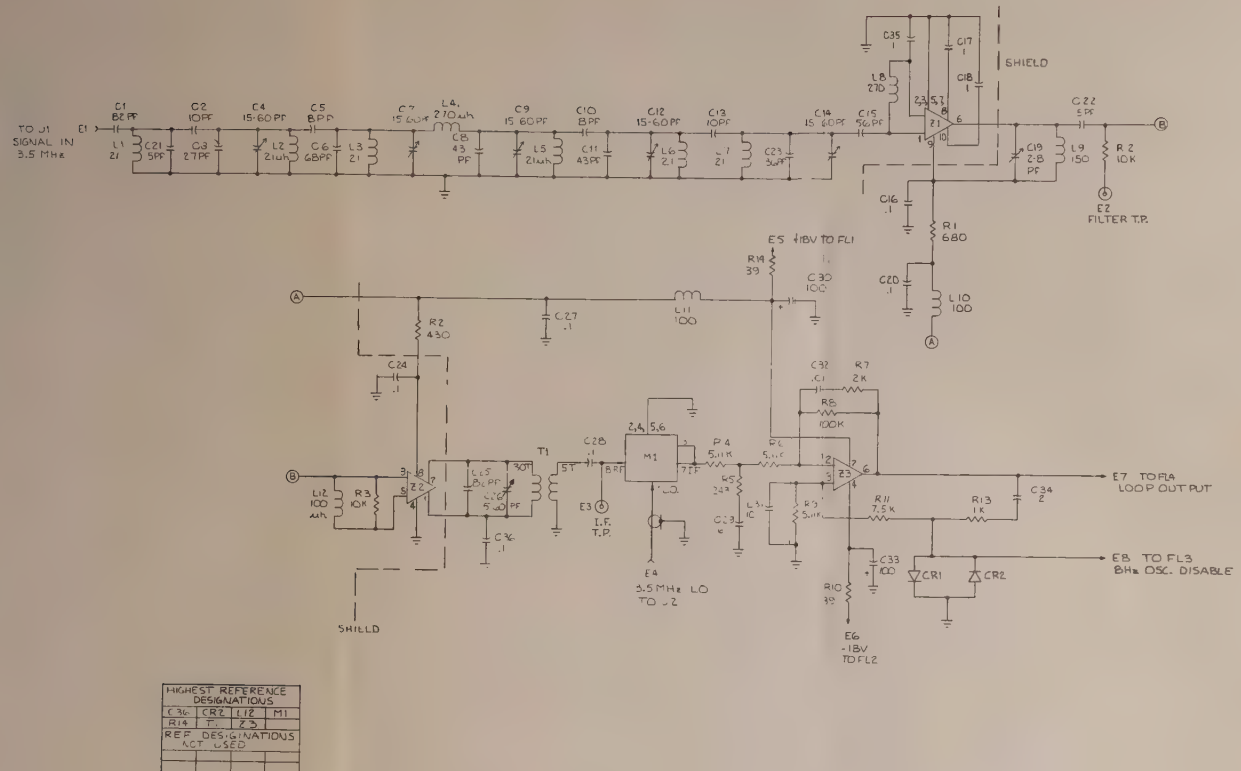


Figure 4-37. Loop Control Board (299459) (Sheet 1 of 2)



NOTES.

- 1) Z1-MC1550G
Z2-U5D770339X
Z3-5N72741P
M1-231104-1
T1-23053-2
CR1, CR2-230542 1
- 2 UNLESS OTHERWISE SPECIFIED
ALL CAPACITORS ARE IN UFD.,
RESISTORS ARE IN Ω ,
AND INDUCTORS ARE IN μ H.

Figure 4-37. Loop Control Board (299459)
(Sheet 2 of 2)

LOOP CONTROL BOARD (299459)

<u>Item</u>	<u>Description</u>	<u>FMC</u>	<u>Part No.</u>
C1	Capacitor, 82 pF, $\pm 5\%$	00752	299241-820
C2	Capacitor, 10 pF, $\pm 5\text{pF}$	00752	299241-100
C3	Capacitor, 27 pF, $\pm 5\%$	00752	299241-270
C4	Capacitor, variable, 15-60 pF	72982	538-011F15-60
C5	Capacitor, 8 pF, $\pm .5\text{ pF}$	00752	299241-080
C6	Capacitor, 68 pF, $\pm 5\%$	00752	299241-680
C7	Capacitor, variable, 15-60 pF	72982	538-011F15-60
C8	Capacitor, 43 pF, $\pm 5\%$	00752	299241-430
C9	Capacitor, variable, 15-60 pF	72982	538-011F15-60
C10	Capacitor, 8 pF, $\pm 5\text{ pF}$	00752	299241-080
C11	Capacitor, 43 pF, $\pm 5\%$	00752	299241-430
C12	Capacitor, variable, 15-60 pF	72982	538-011F15-60
C13	Capacitor, 10 pF, $\pm 5\text{ pF}$	00752	299241-100
C14	Capacitor, variable, 15-60 pF	72982	538-011F15-60
C15	Capacitor, 56 pF	00752	299241-560
C16	Capacitor, 0.1 μF	00752	299245-1
C17	Capacitor, 0.1 μF	00752	299245-1
C18	Capacitor, 0.1 μF	00752	299245-1
C19	Capacitor, variable, 2-8 pF	72982	538-011F15-60
C20	Capacitor, 0.1 μF	00752	299245-1
C21	Capacitor, 1 pF, $\pm .5\text{ pF}$	00752	299241-050
C22	Capacitor, 5 pF, $\pm .5\text{ pF}$	00752	299241-050
C23	Capacitor, 36 pF, $\pm 5\%$	00752	299241-360
C24	Capacitor, 0.1 μF	00752	299241-820
C25	Capacitor, 82 pF, $\pm 5\%$	00752	299241-820
C26	Capacitor, variable, 15-60 pF	72982	538-011F15-60
C27	Capacitor, 0.1 μF	00752	299245-1
C28	Capacitor, 0.1 μF	00752	299245-1
C29	Capacitor, 16 μF	56289	TVAN1204.3
C30	Capacitor, 100 μF , 25 V	56289	TE-1211
C31	Capacitor, 10 μF	56289	TVAN11124
C32	Capacitor, 0.01 μF	00752	299245-2
C33	Capacitor, 100 μF , 25 V	56289	TE-1211
C34	Capacitor, 2 μF , 50 V	14099	22W-A205
C35	Capacitor, 0.1 μF	00752	299245-1
C36	Capacitor, 0.1 μF	00752	299245-1
CR1	Diode	150436	5082-2301
CR2	Diode	50436	5082-2301
L1	Inductor, 21 μH	00752	230531-4
L2	Inductor, 21 μH	00752	230531-4
L3	Inductor, 21 μH	00752	230531-4
L4	Inductor, 270 μH , $\pm 10\%$	71895	1025-78
L5	Inductor, 21 μH	00752	230531-4
L6	Inductor, 21 μH	00752	230531-4
L7	Inductor, 21 μH	00752	230531-4
L8	Inductor, 270 μH , $\pm 10\%$	71895	1025-78

LOOP CONTROL BOARD (299459) (cont)

<u>Item</u>	<u>Description</u>	<u>FMC</u>	<u>Part No.</u>
L9	Inductor, 150 μ H, $\pm 10\%$	71895	1025-72
L10	Inductor, 100 μ H	00472	70F104A1
L11	Inductor, 100 μ H	00472	70F104A1
L12	Inductor, 100 μ H, $\pm 10\%$	71895	1025-68
M1	Mixer, Double balanced	00752	231104-1
R1	Resistor, 680, 1/4 W, 5%	81349	RC07GF681J
R2	Resistor, 430, 1/4 W, 5%	81349	RC07GF431J
R3	Resistor, 10 k, 1/4 W, 5%	81349	RC07GF103J
R4	Resistor, 5.11 k, 1/8 W, 1%	81349	RN60CS111F
R5	Resistor, 243, 1/8 W, 1/	81349	RN60C2430F
R6	Resistor, 5.11 k, 1/8 W, 1/	81349	RN60C5111F
R7	Resistor, 2 k, 1/8 W, 1%	81349	RN60C2001F
R8	Resistor, 100 k, 1/8 W, 1%	81349	RN60C1003F
R9	Resistor, 5.11 k, 1/8 W, 1%	81349	RN60CS111F
R10	Resistor, 39, 1/4 W, 5%	81349	RC07GF390J
R11	Resistor, 7.5 k, 1/4 W, 5%	81349	RC07GF752J
R12	Resistor, 10 k, 1/4 W, 5%	81349	RC07GF103J
R13	Resistor, 1 k, 1/4 W, 5%	81349	RC07GF102J
R14	Resistor, 39, 1/4 W, 5%	81349	RC07GF-390J
T1	Transformer	00752	230531-2
Z1	Integrated Circuit	04713	MC1550G
Z2	Integrated Circuit	07263	US0770339X
Z3	Integrated Circuit	01295	SN72741P

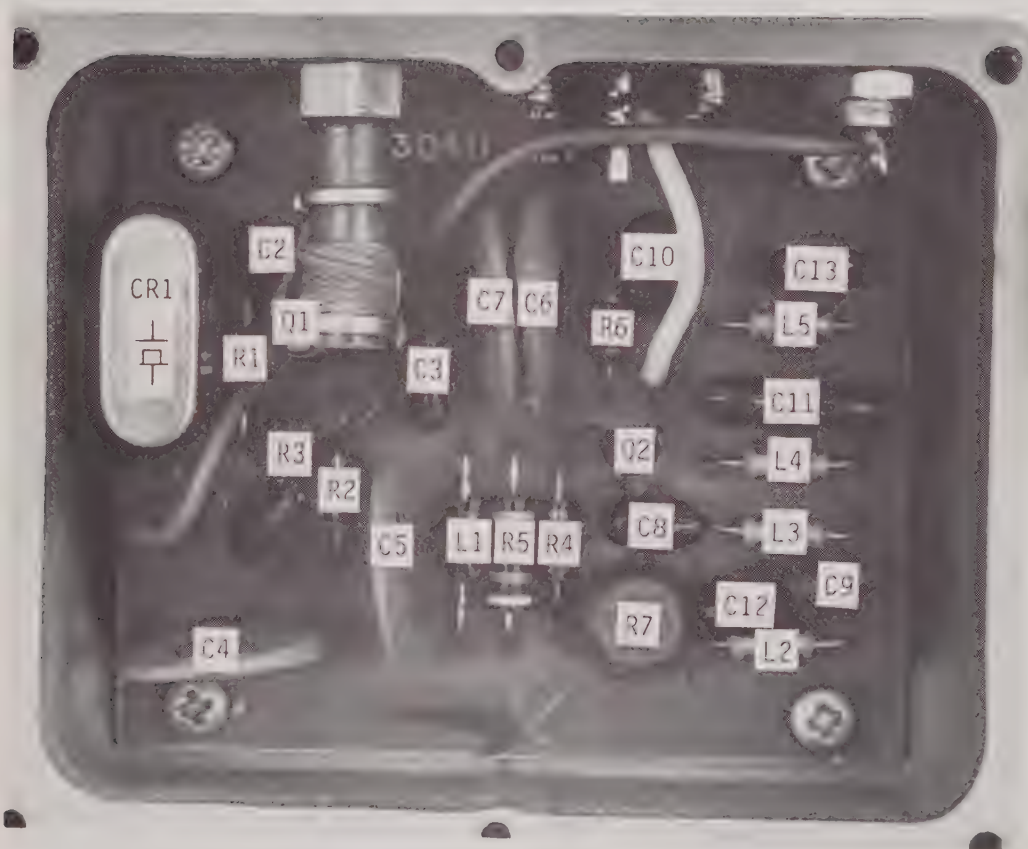


Figure 4-38. 3.5-MHz Oscillator (230410) (Sheet 1 of 2)

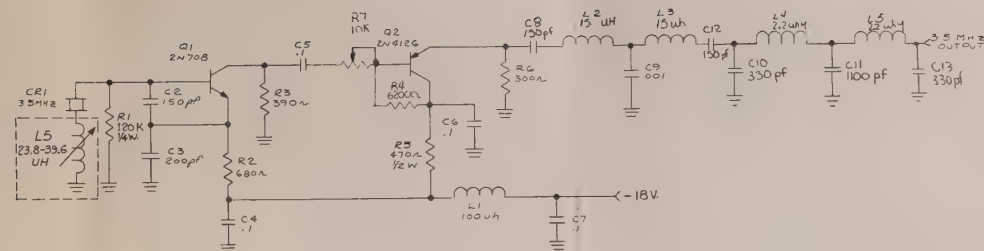
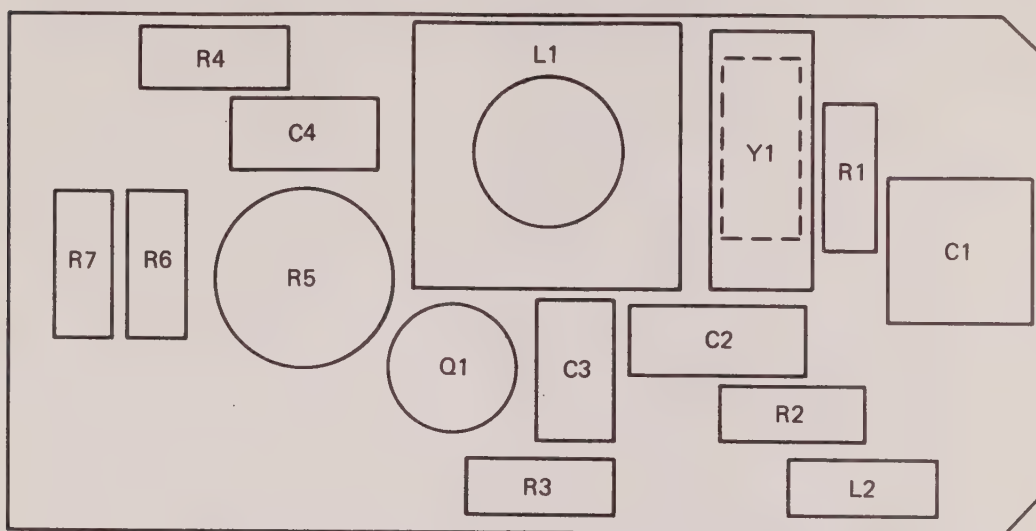
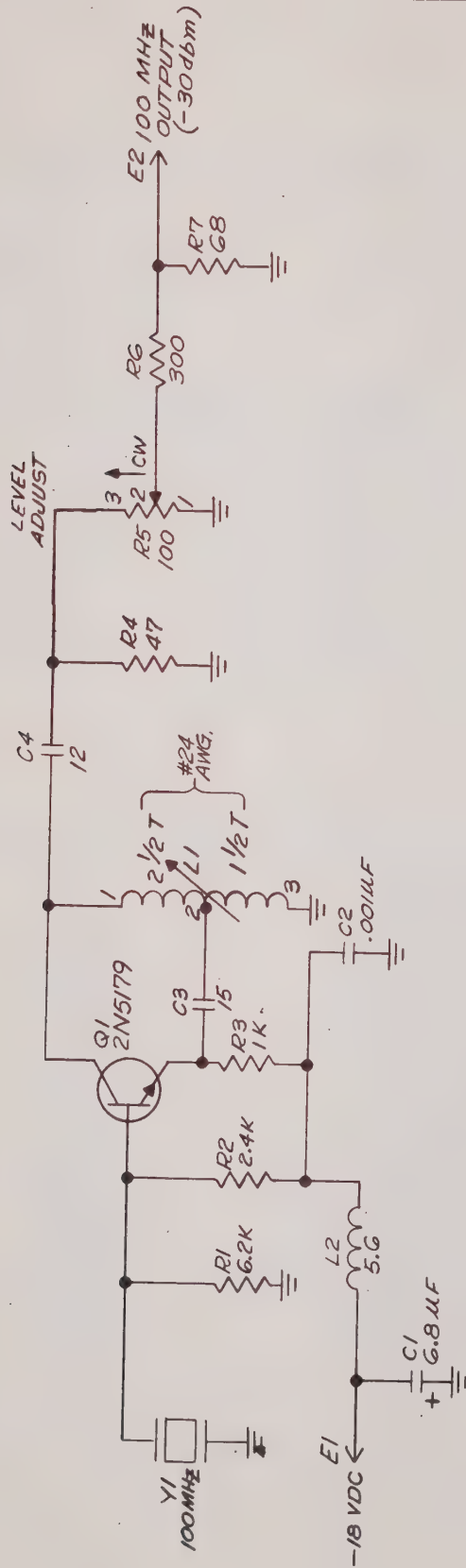


Figure 4-38. 3.5-MHz Oscillator Board (230410)
(Sheet 2 of 2)



100 MHz CAL. OSCILLATOR BOARD (295037) (Sheet 1 of 2)

<u>Item</u>	<u>Description</u>	<u>FMC</u>	<u>Part No.</u>
C1	Capacitor, 6.8 μ F	00752	299240-1
C2	Capacitor, .001 pF	00752	299243
C3	Capacitor, 15 pF	00752	299241-150
C4	Capacitor, 12 pF	00752	299241-120
L1	Inductor, variable	00752	298749-23
L2	Inductor, 5.6 μ H	00752	299237-38
Q1	Transistor	00752	299239-1
R1	Resistor, 6.2 k, 1/4 W	81349	RC07GF622J
R2	Resistor, 2.4 k, 1/4 W	81349	RC07GF242J
R3	Resistor, 1.0 k, 1/4 W	81349	RC07GF102J
R4	Resistor, 47, 1/4 W	81349	RC07GF470J
R5	Resistor, variable, 100 Ω	80294	3339P-1-101
R6	Resistor, 300, 1/4 W	81349	RC07GF301J
R7	Resistor, 68, 1/4 W	81349	RC07GF680J
Y1	Crystal, 100 MHz	81349	230479-2



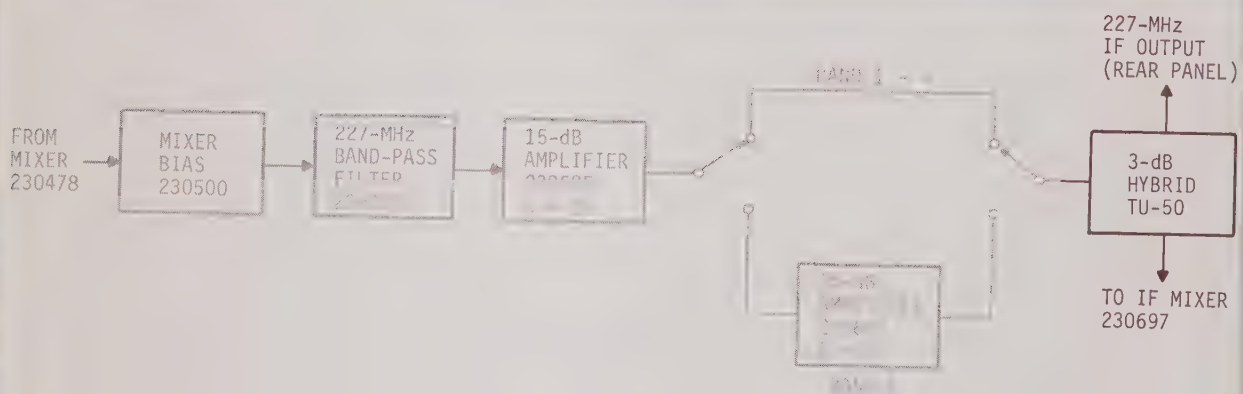
NOTES:
 1- UNLESS OTHERWISE SPECIFIED:
 RESISTOR VALUES ARE IN OHMS.
 CAPACITOR VALUES ARE IN MICROFARADS.
 INDUCTOR VALUES ARE IN MICROHENRIES.

APPENDIX

OPTIONAL FEATURES

002 OPTION

The 002 Option is available to provide a wider bandwidth for analysis and receiver applications. The 227-MHz IF signal is brought out with a 10-MHz bandwidth at the rear panel. The output is fixed-tuned when the AILTECH 727 Spectrum Analyzer is placed in the time domain mode or at a scan width of less than 1 MHz per division. The simplified block diagram of the 002 Option is shown below with a table of the typical conversion loss as a function of Band.

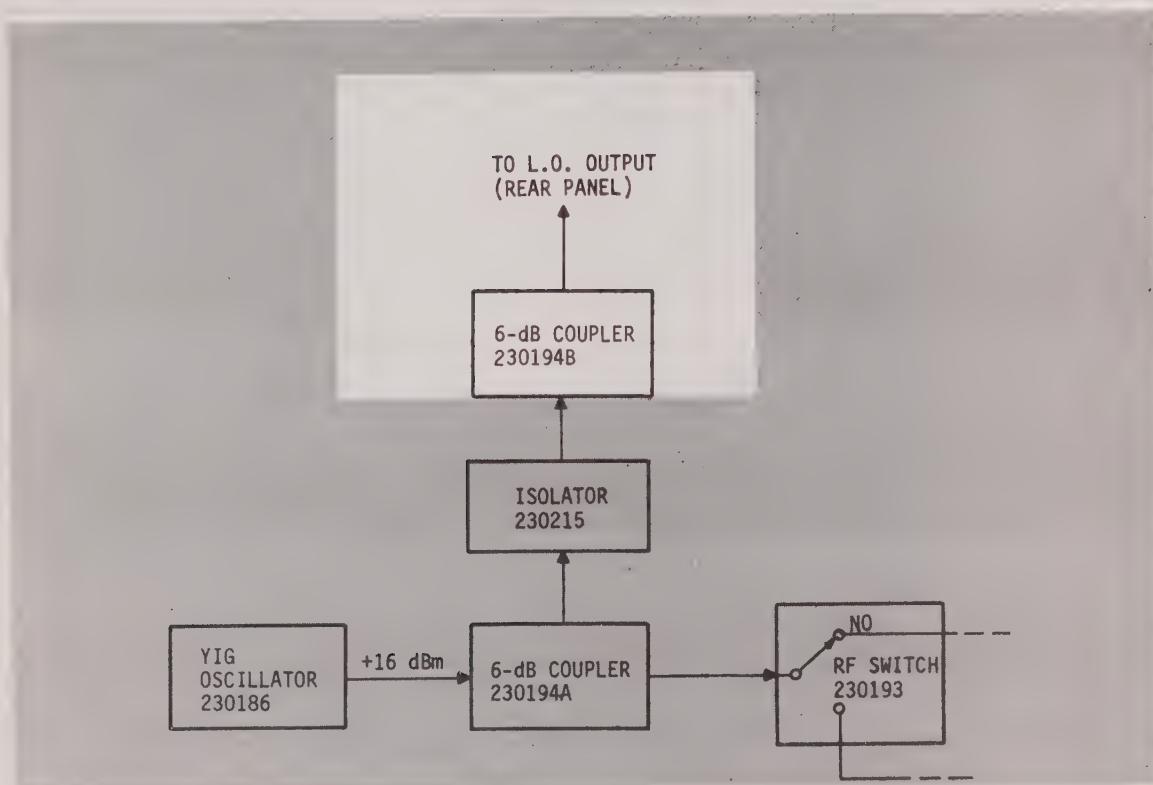


Typical conversion losses/gains from front to rear panel output at 227 MHz.

Band	
1	+10 db Gain
2	8 db Loss
3	14 db Loss
4	20 db Loss
5	10 db Loss

003 OPTION

The 003 Option provides access to the first local oscillator out of the 727. This is done by placing a 6-dB directional coupler in series with the YIG local oscillator and tapping off the coupled-down port. This signal is made available for use as a sweeping signal from 1.7 to 4.3 GHz or to permit highly accurate frequency measurements. The power out at the LO output of the rear panel is typically +5 dbm. The simplified block diagram of the 003 Option is shown below.



727-45 Option

A Rack Mount is available for all 727 models. The rack mount consists of two right angle side plates and spacing shims for the slides.

RECOMMENDED SPARE PARTS
FOR 727 SERIES SPECTRUM ANALYZER

<u>Part Name</u>	<u>Part No.</u>
Sweep Generator	230216
Bias Interface Board	299344
Pre-Amp Board	230480
Digital Display Board	299468
IF Assembly	299350
RF Amplifier	230625
Loop Assembly	299375
LCVCO	230543
IF Attenuator	299367
LOG IF	230390
YIG Driver Board	299375
YIG Driver Heat Sink Assy.	299400
L.V. Power Supply	230426-2
R.F. Coaxial Switch	231079
Microwave Mixer	230567
2060 MHz Oscillator	230817
Mixer	230478
Tuner Assembly	299137
YIG Oscillator	230186
YIG Filter	299463
R.F. Attenuator	230212
R.F. Cable	298505-34
R.F. Cable	298505-40
Switch S1	299475
Auto Centering Board	299378
Switch S2	299476
Switch S3	299302

TEKTRONIX®

This insert is provided as a supplement to the instruction manual furnished with this modified instrument. The information given in this insert supersedes that given in the manual.

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607

MOD WF

MODIFICATION INSERT

This manual insert describes the special features of MOD WF as it applies to the Tektronix 607 Storage Monitor. MOD WF replaces the standard CRT with a special 10 x 10 division internal CRT graticule, having the same characteristics as the standard; changes the implosion shield from clear to blue-tinted; shortens the AC power cord to 12 inches; deletes the POWER/PULL ON knob and Tektronix' identification from the lower panel; deletes the control-panel door and combines the recessed control panel and lower panel as a single flush panel; and adds -X, -Y, and -Z inputs via rear-panel REMOTE PROGRAM connector J20.

The following input connections have been added via J20.

<u>Contact</u>	<u>Function</u>	<u>Connection</u>
11	-Y Input	Vert Ampl, inverting input
12	-X Gnd	Horiz Ampl common*
13	-Z Input	Z-Axis, inverting input
23	-Y Gnd	Vert Ampl common*
24	-X Input	Horiz Ampl, inverting input
25	-Z Gnd	Z-Axis common (chassis ground)

* Normally isolated by 47 Ω from chassis ground.

J20 Interconnections

Differential Operation. Performance characteristics for differential input operation are the same via J20 as via the standard BNC connectors. NOTE: The grounding caps must be removed from J300, J500 and J650 to permit differential or -input operation.

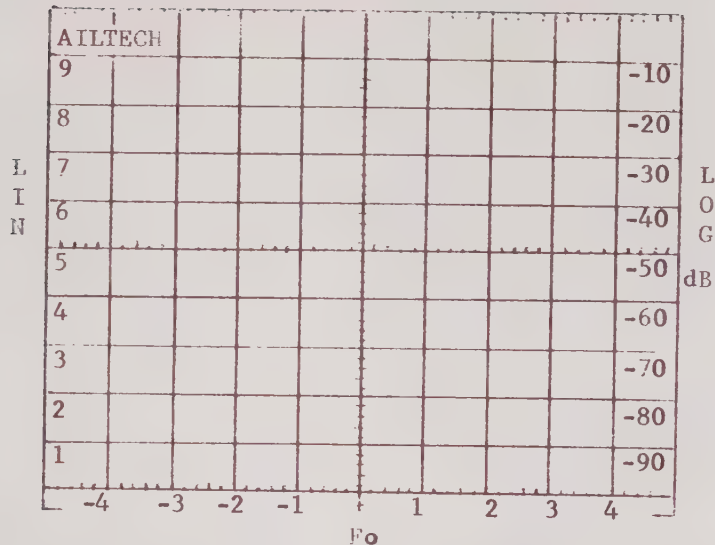
Compatibility. The J20 connections are unique to MOD WF, and are not compatible with fixtures and cables prepared for use with 607 MOD 818B and similarly modified monitors.

X and Y Gain. Gains of the X and Y amplifiers are initially set for Y 125 mV/div; X 133 mV/div, to facilitate X-Y phase checking.

NOTE

MOD WF is compatible with standard catalog option 3 (less handle and feet). Option 1 (internal 8 x 10 graticule) is inapplicable, and Option 4 (added time base) is not compatible with the modified control panel.

607
MOD WF



Internal graticule, special pattern 9.60. Horizontal major divisions are 0.86 cm; Vertical divisions are 0.65 cm.

PARTS LIST

Electrical

Change:

V100 037-4117-00 1 ELECTRON TUBE, CRT, T7420-401-9.60

Mechanical

Add:

030-0967-02	1	SHAFT, extension
034-0759-00	1	ID LABEL
129-0299-00	3	SPACER
131-0890-00	2	CABLE LOCK
358-0378-01	4	PANEL BUSHING

Change:

030-0889-03	1	SHAFT, extension, push on
034-0709-00	1	FRONT PANEL
034-0713-00	1	REAR PANEL
200-1667-00	1	COVER, 25-pin connector
337-1674-00	1	SHIELD, electron tube, CRT, blue-tinted
366-1540-00	2	KNOB
036-3125-00	1	KNOB
366-0261-01	2	KNOB

Delete:

200-1282-00	1	ACCESS DOOR
386-2067-00	1	SUBPANEL

TEKTRONIX®

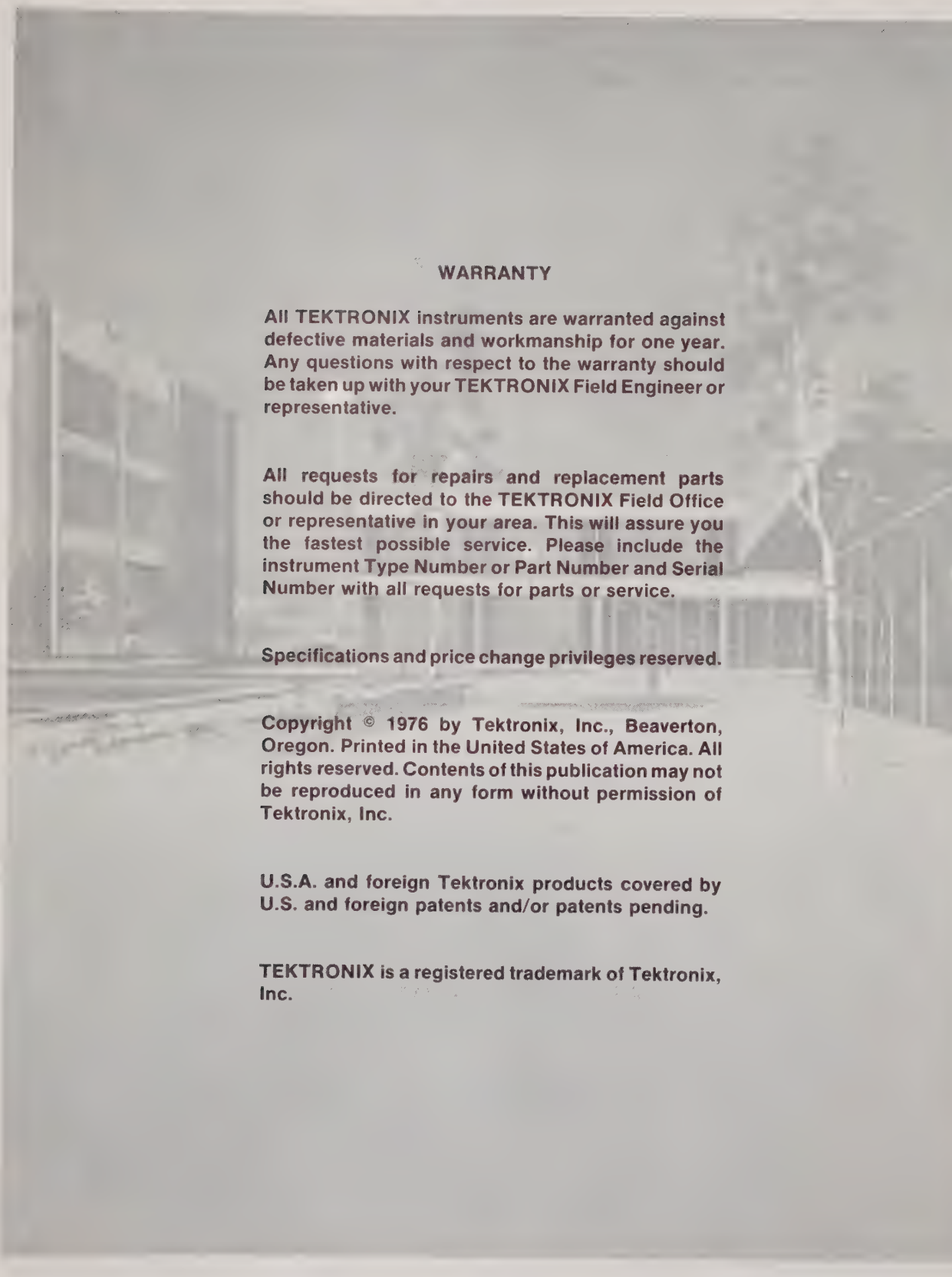
607 MONITOR

WITH OPTIONS

INSTRUCTION MANUAL

Tektronix, Inc.
P.O. Box 500
Beaverton, Oregon 97077

Serial Number _____



WARRANTY

All TEKTRONIX instruments are warranted against defective materials and workmanship for one year. Any questions with respect to the warranty should be taken up with your TEKTRONIX Field Engineer or representative.

All requests for repairs and replacement parts should be directed to the TEKTRONIX Field Office or representative in your area. This will assure you the fastest possible service. Please include the instrument Type Number or Part Number and Serial Number with all requests for parts or service.

Specifications and price change privileges reserved.

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WARNING

THE REMAINING PORTION OF THIS TABLE OF CONTENTS LISTS THE SERVICING INSTRUCTIONS. THESE SERVICING INSTRUCTIONS ARE FOR USE BY QUALIFIED PERSONNEL ONLY. TO AVOID ELECTRICAL SHOCK, DO NOT PERFORM ANY SERVICING OTHER THAN THAT CALLED OUT IN THE OPERATING INSTRUCTIONS UNLESS QUALIFIED TO DO SO.

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OPERATOR SAFETY SUMMARY

This manual contains safety information which the user must follow to ensure safe operation of the Monitor. Warning information is intended to protect the patient and the operator, and Caution information is intended to protect the instrument. The following are general safety precautions which do not appear in the operating sections of this manual and which must be applied during all phases of operation.

WARNING

Medical-Dental Applications

Do not use the amplifier INPUTS for direct patient connection. Signal currents at these connectors, as well as leakage currents, may exceed values considered non-hazardous for direct patient connection.

Although this Monitor is not to be used for direct patient connection, interconnection of this instrument with other equipment can result in application of excessive current to the patient. It is extremely important that the equipment be interconnected in accordance with NFPA 76B-T, Tentative Standard for the Safe Use of Electricity in Patient Care Facilities, section 3038, "Signal Transmission Between Appliances".

Do not operate this instrument in the presence of flammable gases or anesthetics. Explosion can result from operation in such an environment.

Ground the Instrument

For electric-shock protection, insert the power-cord plug only in a proper mating power outlet with a grounding (safety-earth) contact. To assure safe grounding during operation in patient-care facilities, the Hospital-Grade power-cord plug supplied with the instrument (Option 6) must be connected only to a power outlet marked "HOSPITAL-GRADE". Refer qualified service personnel to the servicing information sections of the Instruction Manual for additional information.

Before making external connections to this instrument, always ground the instrument first by connecting the power-cord plug to a proper mating power outlet.

Use Correct Fuse

For continued fire-hazard protection, replace fuse only with one of the proper type and rating. Refer fuse replacement to qualified service personnel only.

The following appear in the text of the operating sections of this manual, and are repeated here for emphasis:

WARNING

Do Not Remove Instrument Covers

High voltage is present inside the instrument. To avoid electric-shock hazard, operating personnel must not remove the protective instrument covers. Component replacement and internal adjustments must be made by qualified service personnel only.

Electric-shock hazard present. Only qualified service personnel may change the input signal requirements. Refer qualified service personnel to the servicing information sections of the 607 Instruction Manual.

Limit Input Signals

To avoid electric-shock hazard, do not apply input signals of more than 25 volts (dc plus peak ac).

CAUTION

Exercise Care With Intensity Level

A high intensity level combined with a stationary spot will damage the crt phosphor. Therefore, set the INTENSITY control for just enough spot intensity for good visibility.

Be careful to set the proper display intensity; a high-amplitude Z-axis input signal, combined with an excessively high setting of the INTENSITY control, may damage the crt phosphor.

SERVICE SAFETY SUMMARY

The following are safety precautions which appear in the servicing information sections of this manual, and are repeated here for emphasis:

WARNING

Medical-Dental Applications

Do not use the amplifier INPUTS for direct-patient connection. Signal currents at these connectors, as well as leakage currents, may exceed values considered non-hazardous for direct-patient connection.

Although this monitor is not to be connected directly to a patient, interconnecting this monitor to other equipment can result in the application of excessive current to a patient. It is extremely important that the interconnection is made in accordance with NFPA 76B-T, Tentative Standard for the Safe Use of Electricity in Patient Care Facilities, section 3038, "Signal Transmission Between Appliances".

Ground the Instrument

The instrument is intended to be operated from a single-phase, earth-referenced power source having one current-carrying conductor (the Neutral Conductor) near earth potential. Operation from power sources where both current-carrying conductors are live with respect to earth (such as phase-to-phase on a three-wire system) is not recommended, since only the Line Conductor has over-current (fuse) protection within the instrument.

This instrument has a three-wire power cord with a polarized two-pole, three-terminal plug for connection to the power source and safety-earth. The safety-earth terminal of the plug is directly connected to the instrument frame. For electric-shock protection, insert this plug only in a mating outlet with a safety-earth contact. Do not defeat the grounding connection. Any interruption of the grounding connection can create an electric-shock hazard. Before making external connections to this instrument, always ground the instrument first by connecting the power-cord plug to a proper mating power outlet.

Disconnect Instrument Power

Disconnect the monitor from the power source, to avoid electric shock, before removing the cabinet panels, replacing components, soldering, or changing the X Atten switch settings.

CRT Handling

Use care when handling a crt. Breakage of the crt causes a high-velocity scattering of glass fragments (implosion). Protective clothing and safety glasses should be worn. Avoid striking the crt on any object which might cause it to crack or implode. When storing a crt, place it in a protective carton or set it face down in a protected location on a smooth surface with a soft mat under the faceplate.

CAUTION

Apply Proper Line Voltage

To prevent damage to the instrument, always check the line-voltage information recorded on the rear panel before applying power to the instrument.

Damage to the instrument may result from incorrect placement of the line-voltage selector plug.

Use Proper Cleaning Agents

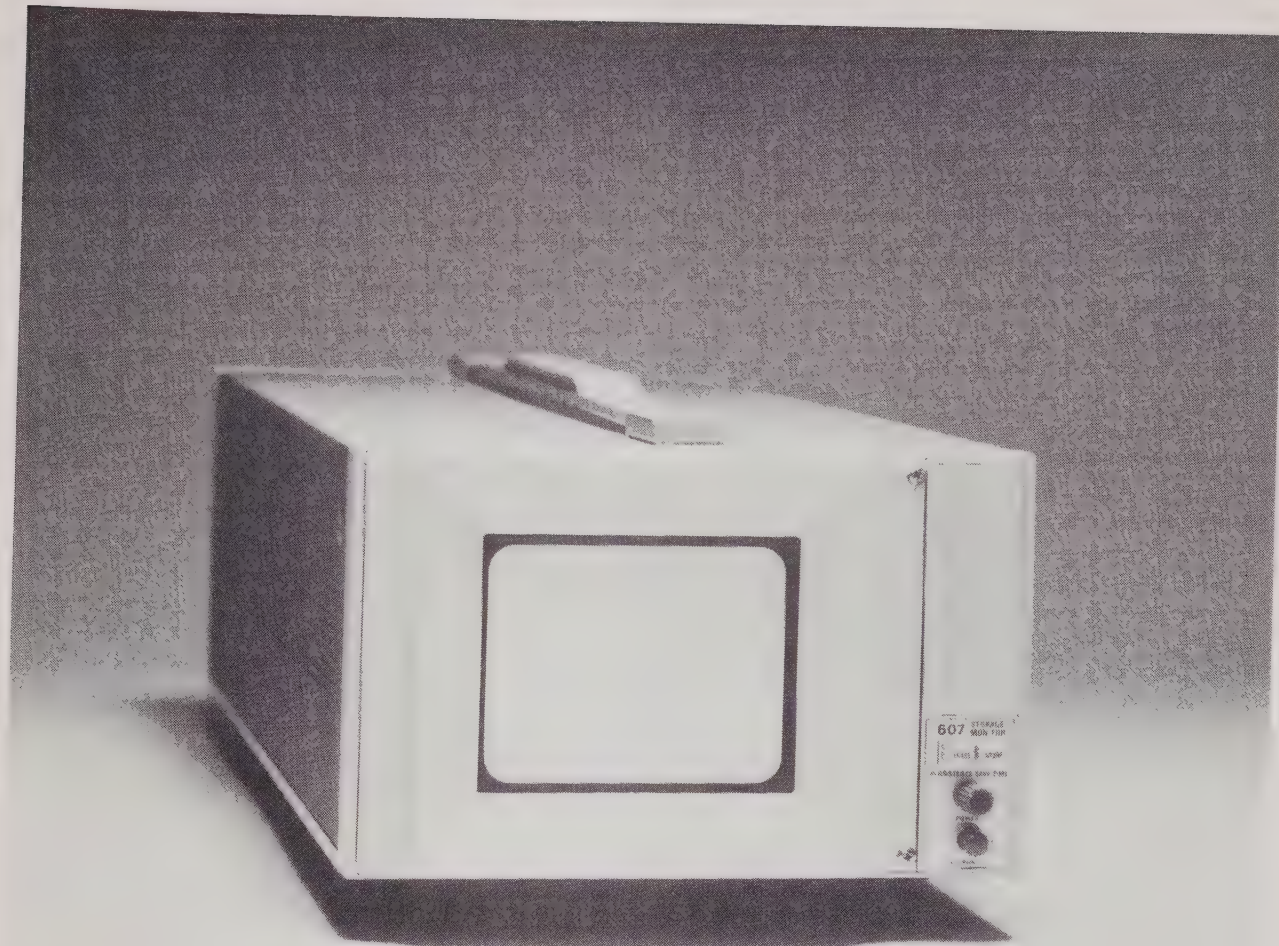
Avoid the use of chemical cleaning agents which might damage the plastics used in this instrument. Use isopropyl alcohol, total denatured ethyl alcohol or TP35. Before using any other solvents, consult your Tekronix Service Center.

Avoid Excessive Moisture

Make sure circuit boards and components are dry before applying power to prevent damage from arcing.

Avoid CRT Phosphor Damage

Do not allow a high-intensity spot to remain stationary on the crt. The crt phosphor could be permanently damaged.



2090-22

FEATURES

The 607 Storage Monitor provides a bright variable-persistence X-Y display of analog data on a 7.2 x 9 centimeter (2.8 x 3.5 inch) viewing area. The 607 is well suited for many display applications in ultrasonic detection, electron microscope, radiation and thermal scanning systems, speech therapy, mechanical pressure, volume, and vibration analysis, and medical and biophysical systems. The 607 may also be used to provide stored displays of alpha-numeric and graphic information from measurement systems, computers and other data-transmission systems.

All display axes (vertical, horizontal and intensity) can be operated differentially as well as from a single-signal source. A Remote Program connector provides access to some operate-mode functions from a remote station. The storage crt allows a display to be stored in excess of 5 minutes (longer display times are possible in the Save mode).

607 Storage Monitor

GENERAL INFORMATION

INTRODUCTION

The Operators Manual contains information necessary to effectively operate the 607 Storage Monitor and is divided into three sections: Section 1 provides packaging for shipment information, specifications, and a list of standard and recommended accessories. Section 2 contains operating information. Information concerning available options for the 607 Storage Monitor is in section 3.

The Instruction Manual contains ten sections. Operating information is covered in the first two sections; servicing information is covered in the remaining eight sections. Schematic diagrams are located at the rear of the manual and can be unfolded for reference while reading other parts of the manual. The reference designators and symbols used on the schematic diagrams are defined on the first page of the Diagrams and Circuit Board Illustrations section. Abbreviations used in the manuals, except in the parts list and schematic diagrams, comply with the American National Standards Institute Y1.1-1972 publication. The parts list is a computer printout and uses computer-supplied abbreviations.

PACKAGING FOR SHIPMENT

If this instrument is to be shipped for long distances by commercial transportation, it is recommended that the instrument be packaged in the original manner for maximum protection. The carton and packaging material in which your instrument was shipped should be saved and used for this purpose.

Also, if this instrument is to be shipped to a Tektronix Service Center for service or repair, attach a tag to the instrument showing the following: Owner of the instrument (with address), the name of an individual at your firm that can be contacted, complete instrument type and serial number, and a description of the service required.

If the original packaging is unfit for use or not available, package the instrument as follows:

1. Obtain a carton of corrugated cardboard having inside dimensions of no less than six inches more than the instrument dimensions; this will allow for cushioning. Refer to Table 1-1 for carton test strength requirements.

TABLE 1-1
Shipping Carton Test Strength

Gross Weight (lb)	Carton Test Strength (lb)
0 - 10	200
10 - 30	275
30 - 120	375
120 - 140	500
140 - 160	600

2. Surround the instrument with polyethylene sheeting to protect the finish of the instrument.
3. Cushion the instrument on all sides by tightly packing dunnage or urethane foam between the carton and the instrument, allowing three inches on all sides.
4. Seal the carton with shipping tape or with an industrial stapler.
5. Mark the address of the Tektronix Service Center and your return address on the carton in one or more prominent locations.

SPECIFICATION

The electrical specifications listed in Table 1-2 apply when the following conditions are met: (1) The instrument must have been adjusted at an ambient temperature between +20° and +30° C, (2) the instrument must be operating in an ambient temperature between 0° and +50° C, and (3) the instrument must have been operating for at least 20 minutes.

TABLE 1-2
Electrical Characteristics

Characteristic	Performance Requirement
VERTICAL AND HORIZONTAL AMPLIFIERS	
Deflection Factor ¹	
Vertical	Nominally set at 1 V within 2%, for 8 div of deflection. Internally adjustable from 0.5 V or less to at least 2.5 V full scale. An internal 5:1 attenuator extends the deflection factor range to at least 12.5 V full scale.
Horizontal	Nominally set at 1 V within 2%, for 8 div of deflection. Internally adjustable from 0.5 V or less to at least 2.5 V full scale. An internal 5:1 attenuator extends the deflection factor range to at least 12.5 V full scale.
Attenuators	Deflection factor reduced five times, within 3%, with 5:1 attenuation.
Polarity (Differential Inputs)	Positive signal applied to + input deflects beam up or to the right; negative signal deflects beam down or to the left. Positive signal applied to – input deflects beam down or to the left; negative signal deflects beam up or to the right.
Settling Time	Spot must reach new writing position within 1 spot diameter within 1 μ s from any on-screen position.
Bandwidth (With 80% Full-Screen Reference Signal)	Dc to at least 3 MHz.
Rise Time	116 ns or less.
Common Mode Rejection	
Dc to 500 kHz	
1X Attenuation	At least 100:1 for signals of +3 V or –3 V peak or less.
5X Attenuation	At least 40:1 for signals of +15 V or –15 V peak or less.
Phase Difference	
Dc to 500 kHz	1° or less between X and Y amplifiers. X and Y amplifier gain must be set for the same deflection factor (V/div).
Position Stability	0.1 div or less per hour after 20 minute warm-up.
Input Resistance and Capacitance (All Inputs)	1 M Ω , within 1%, paralleled by 47 pF or less.
Maximum Nondestructive Input Voltage (Fault Condition Only)	$\pm$ 100 V (dc + peak ac).

¹ Refer qualified service personnel to the servicing information sections of the 607 Instruction Manual.

TABLE 1-2 (CONT.)
Electrical Characteristics

Characteristic	Performance Requirement
Z-AXIS AMPLIFIER	
Useful Input Voltage	Adjustable from +1 V or less to at least +5 V for full intensity when INTENSITY control is set to midrange. 0 V input cuts off visible display.
Useful Frequency Range	Dc to 5 MHz at -3 dB point.
Rise Time	70 ns or less.
Common Mode Rejection Dc to 100 kHz	At least 100:1 with input signals to 5 V peak-to-peak at any setting of Z-axis gain.
Input Resistance and Capacitance (Both Inputs)	1 M Ω within 1%, paralleled by 47 pF or less.
Maximum Nondestructive Input Voltage (Fault Condition Only)	± 100 V (dc + peak ac). Crt beam positioned off screen.
REMOTE PROGRAM Connector Remote Inputs	+0.52 V or less provides active low. Open input or at least +2.5 V is high logic level.
Erase Interval Output	Active low logic is +0.4 V or less. High logic level is at least +2.5 V.
CRT DISPLAY	
Graticule	8 X 10 div (0.9 cm/div).
Geometry (Within Graticule Area)	Bowing or tilt 0.1 div or less.
Orthogonality (Within Graticule Area)	90° within 0.7°.
Halftone Luminance (Within 6 X 8 Div Quality Area)	At least 200 fL.
Stored Dot Writing Time	A stationary dot written in 500 ns or less can be viewed for at least 15 seconds. With a black background, a stationary dot written in 1 μ s or less can be viewed for at least 3 minutes.
Stored Linear Writing Speed (Within 6 X 8 Div Quality Area)	At least 0.8 div/ μ s, viewable for 1 minute.
Halftone Resolution (Within 6 X 8 Div Quality Area)	At least 18 dots/div.
Erase Time	Approximately 0.5 second.
Acceleration Potential	12 kV.

TABLE 1-2 (CONT.)
Electrical Characteristics

Characteristic	Performance Requirement
POWER SOURCE	
Line Voltage Range	
120 V AC (Nominal)	
Low	90 to 110 V ac.
Medium	99 to 121 V ac.
High	108 to 132 V ac.
220 V AC (Nominal)	
Low	180 to 220 V ac.
Medium	198 to 242 V ac.
High	216 to 250 V ac.
Line Frequency Range	48 to 440 Hz.
Maximum Power Consumption (120 V AC, 60 Hz)	53 W, 0.62 A.
Fuse Data	
120 V AC (Nominal)	0.7 A, 3 AG, slow-blowing type.
220 V AC (Nominal)	0.4 A, 3 AG, slow-blowing type.
High Voltage Supply	2 A, 3 AG, fast-blowing type.
OPTION 4 HORIZONTAL SWEEP	
Sweep Rate	
Range	0.1 s/div to 1 μ s/div, in decade steps.
Accuracy Over Center 8 Divisions	Within 3% with VARIABLE fully clockwise.
Linearity of Any 2 Division Portion Within Center 8 Divisions	Within 2% except for first 5% of total sweep length.
VARIABLE (Uncalibrated)	Provides continuously variable sweep rates between calibrated settings. Decreases each sweep rate setting by at least 10:1. Extends slowest sweep rate to at least 1 s/div.
Trigger Sensitivity	At least 0.5 div vertical deflection from dc to 2 MHz.

TABLE 1-3
Environmental Characteristics

Characteristic	Performance Requirement
Temperature	
Operating	0° to +50° C (+32° to +122° F).
Nonoperating	–40° to +70° C (–40° to +158° F).
Altitude	
Operating	To 15,000 feet.
Nonoperating	To 50,000 feet.
Transportation	Qualified under National Safe Transit Committee Test Procedure 1A, Category II.

TABLE 1-4
Physical Characteristics

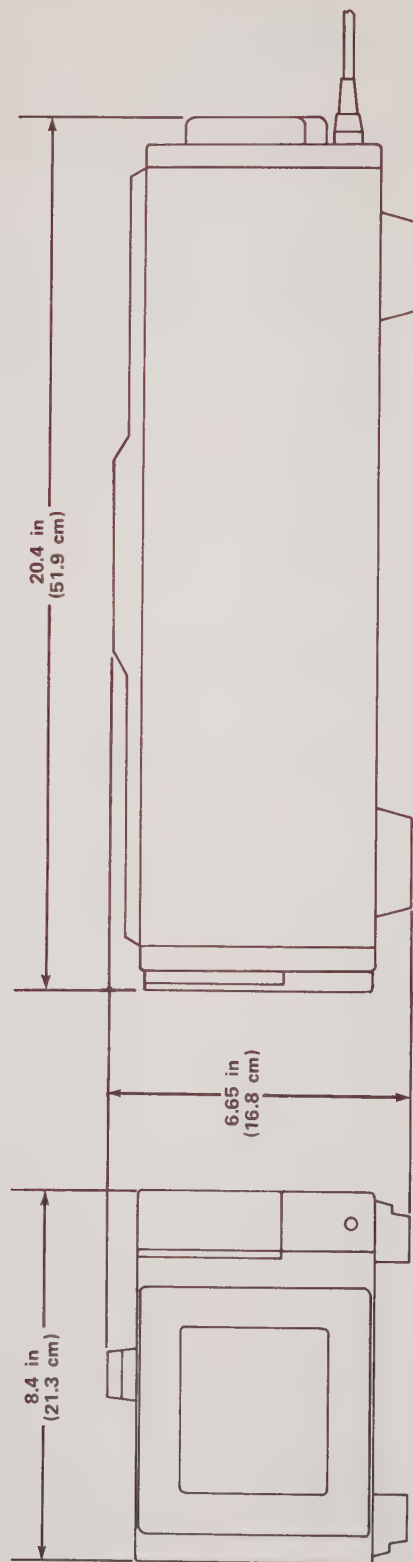
Characteristic	Description
Net Weight	
Cabinet and Rackmount	17.5 lbs (7.9 kg).
Overall Dimensions	See Figure 1-1, Dimensional Drawing.

STANDARD ACCESSORIES

1 each Operators Manual
 1 each Instruction Manual
 1 each Graticule, 8 X 10 Div
 1 each Connector
 1 each Connector Cover

For more detailed information, refer to the tabbed Accessories page in the back of the 607 Instruction Manual.

OVERALL DIMENSIONS
(MEASURED AT MAXIMUM POINTS)



NOTE: DIMENSIONS ARE GIVEN WITH TOP FIGURE IN INCHES AND BOTTOM FIGURE IN CENTIMETERS.
REFER TO DIAGRAMS AND CIRCUIT BOARD ILLUSTRATIONS FOR A DETAILED DIMENSIONAL DRAWING.

C2091-22

Figure 1-1. Dimensional drawing.

RECOMMENDED ACCESSORIES

The following accessories have been selected from our catalog specifically for your instrument. They are listed as a convenience to help you meet your measurement needs. For detailed information and prices, refer to a Tektronix Products Catalog or contact your local Tektronix Field Representative.

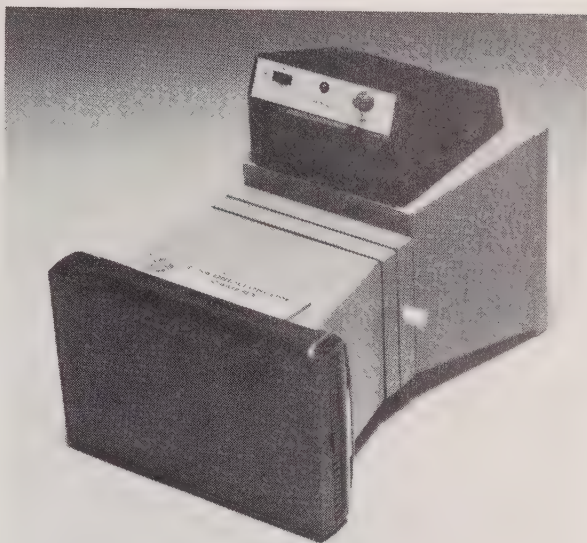
CAMERAS

C-5A: The C-5A is a low-cost general-purpose camera with a Polaroid Pack-Film Back, pulsed graticule illumination, and a fixed f/16 lens. Magnification may be set at 0.67 or 0.85.

Order C-5A

C-5A Opt. 1: The C-5A Opt. 1 camera is the C-5A without the pulsed graticule illumination feature.

Order C-5A Opt. 1



C-30A: The C-30A is a general purpose, variable magnification camera featuring a moderately fast f/1.9 lens and a mechanical shutter. Shutter speeds: 1 to 1/60 second, plus Bulb and Time. Camera requires adapter 016-0248-00 for use with your Monitor.

Adapter, Order 016-0248-00

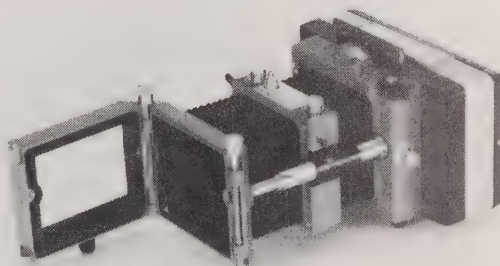
Camera with Pack-Film Back, Order C-30A-P

Camera with Roll-Film Back, Order C-30A-R

Electric Shutter Option: The C-30A camera can be ordered with an integral electric shutter in place of the standard mechanical shutter.

Camera with Pack-Film Back, Order C-30A-PE

Camera with Roll-Film Back, Order C-30A-RE



CART

TEK LAB CART MODEL 3: Mobile equipment cart with 14" X 21" top tray, lockable storage drawer, and extra instrument tray.

Order **TEK LAB CART MODEL 3**



OPERATING INSTRUCTIONS

CONTROLS AND CONNECTORS

Controls and connectors necessary for X-Y operation of the 607 Storage Monitor are located on the front and rear panels of the instrument. To make full use of the capabilities of this instrument, the operator should be familiar with the function and use of each external control and connector. A brief description of the front-panel controls is given in Figure 2-1 and the rear-panel controls and connectors in Figure 2-2.

NOTE

Internal switches are provided for selecting X and Y input signal attenuation and internal sweep operation (Option 4). The proper operation of these switches is described for qualified service personnel in the servicing information sections of the 607 Instruction Manual.

WARNING

High voltage is present inside the instrument. To avoid electric-shock hazard, operating personnel must not remove the protective instrument covers. Component replacement and internal adjustments must be made by qualified service personnel only.

AMBIENT TEMPERATURE CONSIDERATIONS

This instrument can be operated where the ambient air temperature is between 0° and +50° C (+32° and +122° F), and can be stored in ambient temperatures between -40° and +70° C (-40° and +158° F). After being stored in temperatures beyond the operating limits, allow the chassis temperature to return to within the operating limits before applying power. Other environments and mounting configurations, such as in an instrument rack, may require additional cooling measures. Operating the instrument at an ambient temperature substantially higher than that specified may result in poor reliability and substandard performance.

FUNCTIONAL CHECK

The following procedures are provided to aid in obtaining a display and may be used as a check of basic instrument operation. The first procedure applies for an instrument

without the Option 4 internal sweep. The procedures can be used for incoming inspection to verify proper operation, and can also be used by the operator for instrument familiarization. Only instrument functions, and not measurement quantities or specifications, are checked in these procedures. Therefore, a minimum amount of test equipment is required. If performing the Functional Check procedures reveals improper performance or instrument malfunction, first check the operation of associated equipment; then refer the instrument to qualified service personnel for repair or adjustment.

Test Equipment Required

The following test equipment was used to perform the Functional Check procedures. Other test equipment, which meets these requirements, may be substituted. When other equipment is substituted, the control settings or set-up may need to be altered.

1. Power Module

Description: Tektronix TM 500-series power module with one or more plug-in compartments.

Type Used: Tektronix TM 501 (used with the FG 503 Function Generator).

2. Function Generator

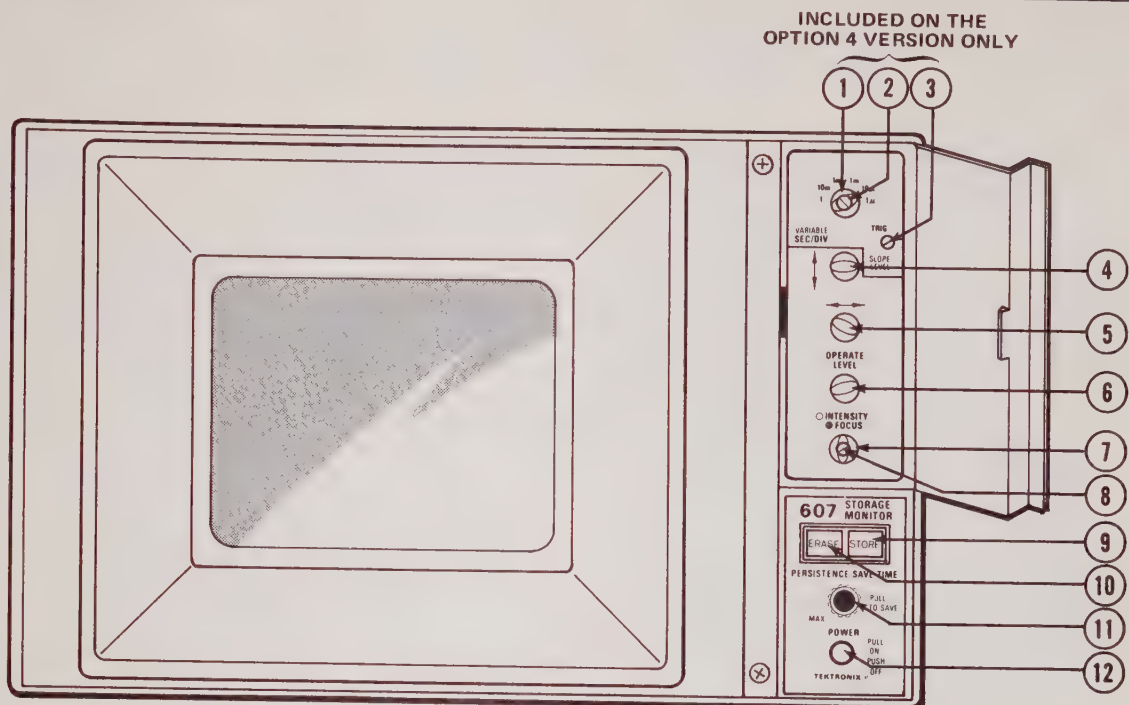
Description: Frequency range, 1 hertz to 50 kilohertz; output amplitude, 1 volt peak-to-peak into 50 ohms; waveform output, sine wave.

Type Used: Tektronix FG 503 (used with TM 501 Power Module).

3. Cables (3 Required)

Description: Length, 42 inches (1 required), 18 inches (2 required); connectors, BNC.

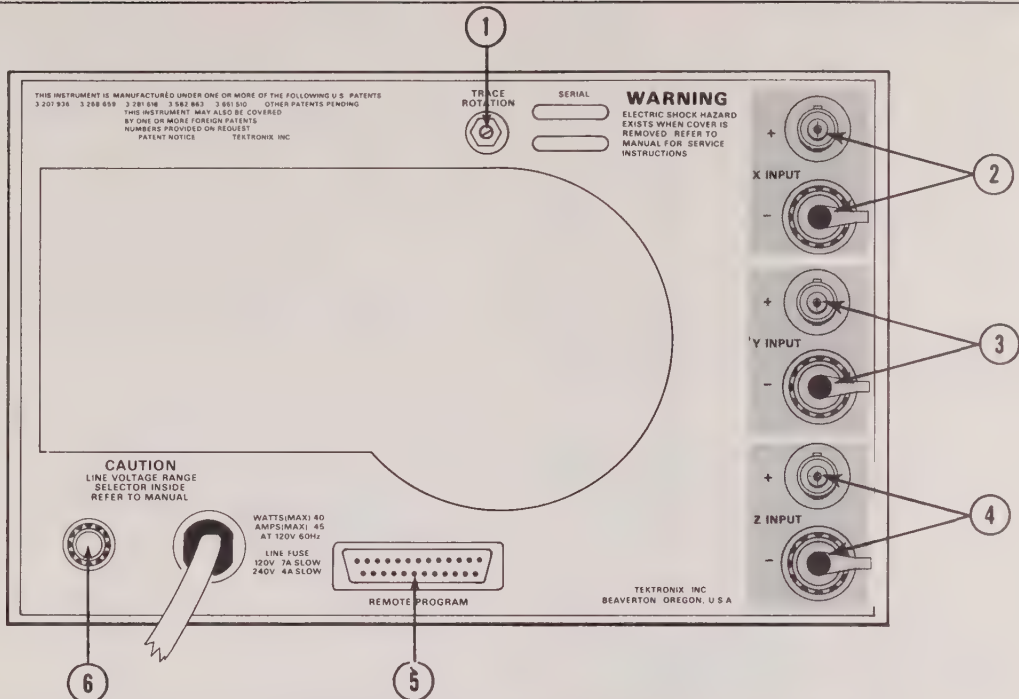
Type Used: Type RG-58/U, 50-ohm coaxial; Tektronix Part 012-0057-01 (42 inch), Tektronix Part 012-0076-00 (18 inch).



- 1 **SEC/DIV Switch (Option 4 only)**—Selects from six calibrated sweep rates from 0.1 second/division to 1 micro-second/division in decade steps. (VARIABLE control must be fully clockwise for indicated sweep rate.)
- 2 **VARIABLE SEC/DIV Control (Option 4 only)**—Screwdriver adjustment concentric with the SEC/DIV switch. Provides uncalibrated, continuously variable sweep rates between calibrated steps. Extends the slowest sweep-rate range to 1 second/division.
- 3 **TRIG SLOPE/LEVEL Control (Option 4 only)**—Screwdriver adjustment that selects the slope and level of the vertical signal from which the sweep is triggered.
- 4 **Vertical (↑↓) Position Control**—Moves writing beam or display up or down.
- 5 **Horizontal (←→) Position Control**—Moves writing beam or display to the right or left.
- 6 **OPERATE LEVEL Control**—Varies the writing speed and contrast of a stored display.
- 7 **INTENSITY Control**—Varies the brightness of a non-stored display.
- 8 **FOCUS Control**—Screwdriver adjustment concentric with the INTENSITY control that provides a well-defined display.
- 9 **STORE Push Button**—Selects storage operation when pushed in and non-storage operation when in the out position.
- 10 **ERASE Push Button**—Erases the stored display when pushed in.
- 11 **PERSISTENCE/SAVE TIME Control**—Varies the persistence of the crt screen from a fraction of a second with the knob pushed in and turned fully clockwise to maximum store time in the fully counterclockwise (MAX) position (maximum store time depends on the setting of the OPERATE LEVEL control). With the knob pulled out, the monitor is in the save mode which extends the store time beyond that available with the knob pushed in. In the save mode (knob pulled out), the display controls are disabled to prevent accidentally erasing or changing the stored display. To view the stored display, the knob must be pushed in or turned clockwise.
- 12 **POWER Switch**—Turns instrument power on when pulled out and off when pushed in.

2090-2

Figure 2-1. Location and function of front-panel controls.



- 1 **TRACE ROTATION Control**—Screwdriver adjustment that aligns the trace with the crt horizontal axis.
- 2 **X INPUT Connectors**—
 - +: BNC connector that deflects the beam to the right with a positive signal applied and to the left with a negative signal applied.
 - : BNC connector that deflects the beam to the left with a positive signal applied and to the right with a negative signal applied.
- 3 **Y INPUT Connectors**—
 - +: BNC connector that deflects the beam up with a positive signal applied and down with a negative signal applied.
 - : BNC connector that deflects the beam down with a positive signal applied and up with a negative signal applied.
- 4 **Z INPUT Connectors**—
 - +: BNC connector that provides a linear function to increase display brightness with a positive signal applied and decrease display brightness with a negative signal applied.
 - : BNC connector that provides a linear function to decrease display brightness with a positive signal applied and increase display brightness with a negative signal applied.
- 5 **REMOTE PROGRAM Connector**—Twenty-five pin connector that provides remote inputs and outputs. See Detailed Operating Information for additional details.
- 6 **Fuse Holder (Located inside the instrument for Option 6 version*)**—Contains the line-voltage fuse to protect the instrument from excessive line-voltage surges.

*Refer qualified service personnel to the servicing information sections of the 607 Instruction Manual for further information.

2090 5

Figure 2-2. Location and function of rear-panel controls and connectors.

4. T Connector

Description: Connectors, BNC to BNC.

Type Used: BNC-to-BNC T connector; Tektronix Part 103-0030-00.

5. Adapter

Description: Connectors, BNC female to BNC female.

Type Used: BNC female-to-BNC female; Tektronix Part 103-0028-00.

Preliminary Set Up

1. Connect the 607 power cord to a suitable power source.

NOTE

Check the line-voltage information recorded on the rear panel. If the source voltage is not within this range, refer qualified service personnel to the servicing information sections of the 607 Instruction Manual.

2. Open the access door on the front panel and set the controls as follows:

SEC/DIV (Option
4 only) 10 μ
Vertical and Horizontal Position . . . Midrange
OPERATE LEVEL . Fully clockwise
INTENSITY Fully counterclockwise
STORE Non store (button out)
PERSISTENCE/
SAVE TIME Midrange and knob
pushed in
POWER On (button out)

3. Allow at least one minute for the instrument to warm up.
4. Proceed to the appropriate Functional Check procedure for your instrument.

NOTE

Refer qualified service personnel to the servicing information sections of the 607 Instruction Manual to determine: (1) If your instrument employs an internal sweep (Option 4), and (2) if the amplifier input attenuators are set at 1X.

Instruments Without Internal Sweep

DISPLAY FUNCTIONS

1. Perform the Preliminary Set Up procedure.
2. Slowly turn the INTENSITY control clockwise until a spot appears on the crt.
3. Turn the INTENSITY control further clockwise and notice that the displayed spot intensity increases.

CAUTION

A high intensity level combined with a stationary spot will damage the crt phosphor. Therefore, set the INTENSITY control for just enough spot intensity for good visibility.

4. Adjust the FOCUS control for a sharp, well-defined spot.
5. Turn the vertical and horizontal Position controls and notice that the spot position can be controlled by both Position controls.

DEFLECTION AND Z-AXIS FUNCTIONS

1. Perform the Preliminary Set Up procedure.
2. Set the function generator for a 1-volt (peak-to-peak), 50-kilohertz sine-wave output.
3. Connect the function generator output to the rear-panel +X INPUT connector via the 42-inch cable.
4. Center the display with the horizontal Position control and check for 8 divisions of horizontal deflection.
5. Remove the grounding cap from the -X INPUT connector.
6. Disconnect the signal from the +X INPUT connector and connect it to the -X INPUT connector.
7. Place the grounding cap on the +X INPUT connector.
8. Center the display with the horizontal Position control.
9. Check for 8 divisions of horizontal deflection.

10. Disconnect the signal from the —X INPUT connector and connect it to the +Y INPUT connector.

11. Center the display on the crt with the vertical Position control.

12. Check for 8 divisions of vertical deflection.

13. Remove the grounding cap from the —Y INPUT connector.

14. Disconnect the signal from the +Y INPUT connector and connect it to the —Y INPUT connector.

15. Place the grounding cap on the +Y INPUT connector.

16. Center the display on the crt with the vertical Position control.

17. Check for 8 divisions of vertical deflection.

18. Adjust the INTENSITY control for a barely-visible display.

19. Remove the grounding caps from the +X INPUT and the +Z INPUT connectors.

20. Disconnect the signal from the —Y INPUT connector and connect it to the +X INPUT and the +Z INPUT connectors via the 42-inch cable, BNC-to-BNC adapter, BNC T connector, and the two 18-inch cables.

21. Place the grounding caps on the —X INPUT and the —Z INPUT connectors.

22. Notice that the right end of the crt display becomes bright, and that the left end disappears.

23. Remove the grounding cap from the —Z INPUT connector.

24. Disconnect the signal from the +Z INPUT connector and connect it to the —Z INPUT connector.

25. Place the grounding cap on the +Z INPUT connector.

26. Notice that the left end of the crt display becomes bright, and that the right end disappears.

27. Disconnect the function generator.

28. Replace the grounding caps on the — (inverting) INPUT connectors.

STORAGE FUNCTIONS

1. Perform the Preliminary Set Up procedure.

2. Press the STORE button and notice that the crt floods momentarily.

3. Set the INTENSITY control for a visible spot on the crt.

NOTE

If the crt blooms around the displayed spot, reduce the INTENSITY control setting.

4. Slowly move the displayed spot with the vertical Position control and notice that the spot leaves a visible trail on the crt.

5. Turn the PERSISTENCE/SAVE TIME control clockwise and repeat step 4. Notice that the trail persists for a shorter time and the background brightens as the PERSISTENCE/SAVE TIME control is turned clockwise.

6. Set the PERSISTENCE/SAVE TIME control to the fully counterclockwise detent (MAX) position.

7. Move the displayed spot with the vertical Position control to obtain a stored trace. If necessary, increase the INTENSITY control setting.

8. Turn the OPERATE LEVEL control fully counterclockwise and notice that the trace intensity decreases (or disappears entirely depending on the INTENSITY control setting).

9. Move the displayed spot with either Position control to again obtain a stored trace.

10. Press and release the ERASE button and notice that the crt floods, then erases, the trace.

Operating Instructions—607

11. Move the displayed spot with either Position control to again obtain a stored trace.

12. Pull the PERSISTENCE/SAVE TIME knob out to the PULL TO SAVE position and notice that the trace disappears.

13. Turn the PERSISTENCE/SAVE TIME control clockwise and notice that the trace reappears.

14. Turn the Position and INTENSITY controls and notice that they have no effect on the display.

15. Turn the PERSISTENCE/SAVE TIME control fully counterclockwise to the detent (MAX) position and notice that the trace disappears.

16. Press the PERSISTENCE/SAVE TIME knob in and notice that the trace reappears.

17. Turn the PERSISTENCE/SAVE TIME control fully clockwise and notice that the crt brightens and the trace disappears.

This completes the Functional Check procedure for the standard 607 (without Option 4).

Instruments With Internal Sweep (Option 4)

NOTE

The following procedure applies to the Option 4 version of the 607 that has been properly set for internal sweep operation. Refer qualified service personnel to the servicing information sections of the 607 Instruction Manual to determine if the internal sweep has been connected.

DISPLAY FUNCTIONS

1. Perform the Preliminary Set Up procedure.

2. Slowly turn the INTENSITY control clockwise until a horizontal trace appears on the crt.

3. Turn the INTENSITY control further clockwise and notice that the displayed trace intensity increases.

4. Adjust the FOCUS control for a sharp, well-defined trace.

5. Turn the vertical and horizontal Position controls and notice that the trace position can be controlled by both Position controls.

DEFLECTION AND Z-AXIS FUNCTIONS

1. Perform the Preliminary Set Up procedure.

2. Set the function generator for a 1-volt (peak-to-peak), 50-kilohertz sine-wave output.

3. Connect the function generator output to the rear-panel +Y INPUT connector via the 42-inch cable.

4. Center the display with the vertical Position control. If necessary, adjust the TRIG SLOPE/LEVEL control for a stable display.

5. Check for 8 divisions of display.

6. Remove the grounding cap from the —Y INPUT connector.

7. Disconnect the signal from the +Y INPUT and connect it to the —Y INPUT connector.

8. Place the grounding cap on the +Y INPUT connector.

9. Center the display with the vertical Position control. If necessary, adjust the TRIG SLOPE/LEVEL control for a stable display.

10. Check for 8 divisions of vertical deflection.

11. Remove the grounding caps from the +Y INPUT and the +Z INPUT connectors.

12. Disconnect the signal from the —Y INPUT connector and connect it to the +Y INPUT and the +Z INPUT connectors via the 42-inch cable, BNC-to-BNC adapter, BNC T connector and the two 18-inch cables.

13. Place the grounding caps on the —Y INPUT and the —Z INPUT connectors.

14. Notice that only the top portion of the display is visible.

15. Remove the grounding cap from the —Z INPUT connector.
16. Disconnect the signal from the +Z INPUT connector and connect it to the —Z INPUT connector.
17. Place the grounding cap on the +Z INPUT connector.
18. Notice that only the bottom portion of the display is visible.
19. Disconnect the function generator.
20. Replace the grounding caps on the — (inverting) INPUT connectors.

STORAGE FUNCTIONS

1. Perform the Preliminary Set Up procedure.
2. Press the STORE button and notice that the crt floods momentarily.
3. Set the INTENSITY control for a bright trace on the crt.

NOTE

If the crt blooms around the displayed trace, reduce the INTENSITY control setting.

4. Slowly move the displayed trace with the vertical Position control and notice that the trace leaves a visible trail on the crt.
5. Turn the PERSISTENCE/SAVE TIME control clockwise and repeat step 4. Notice that the trail persists for a shorter time and the background brightens as the PERSISTENCE/SAVE TIME control is turned clockwise.
6. Set the PERSISTENCE/SAVE TIME control to the fully counterclockwise detent (MAX) position.
7. Move the displayed trace with the vertical Position control to obtain a display of stored lines. If necessary, decrease the INTENSITY control setting.

8. Turn the OPERATE LEVEL control fully counterclockwise and notice that the trace intensity decreases (or disappears entirely depending on the INTENSITY control setting).

9. Move the displayed trace with the vertical Position control to again obtain a display of stored lines.

10. Press and release the ERASE button and notice that the crt floods, then erases, the stored lines.

11. Move the displayed trace with the vertical Position control to again obtain a display of stored lines.

12. Pull the PERSISTENCE/SAVE TIME knob out to the PULL TO SAVE position and notice that the display disappears.

13. Turn the PERSISTENCE/SAVE TIME control clockwise and notice that the display reappears.

14. Turn the Position and INTENSITY controls and notice that they have no affect on the display.

15. Turn the PERSISTENCE/SAVE TIME control fully counterclockwise to the detent (MAX) position and notice that the display disappears.

16. Press the PERSISTENCE/SAVE TIME knob in and notice that the display reappears.

17. Turn the PERSISTENCE/SAVE TIME control fully clockwise and notice that the crt brightens and the display disappears.

This completes the Functional Check procedure for the 607 Option 4.

DETAILED OPERATING INFORMATION

Signal Connectors

BNC connectors are provided at the rear of the instrument for application of input signals to the Horizontal (X) and Vertical (Y) Amplifiers for display on the crt, and to the Z-Axis Amplifier to control display intensity. Each amplifier is designed for either single-ended or differential

operation. The 607 is shipped from the factory prepared for single-ended operation with a grounding cap connected to the — (inverting) input of each axis. For differential operation, remove the grounding cap and apply the input signals to the BNC connectors of the appropriate axis.

Input Signal Requirements

The vertical (Y) and horizontal (X) deflection factors are set at the factory to one volt for 8 divisions of deflection on each axis. Thus, as shipped, the input signal required for each division of deflection is 0.125 volt.

NOTE

The Functional Check procedure may be used to determine if the vertical and horizontal deflection factors of your particular instrument meet those set at the factory.

WARNING

Electric-shock hazard present. Only qualified service personnel may change the input signal requirements. Refer qualified service personnel to the servicing information sections of the 607 Instruction Manual.

The best transient response is achieved when the input signal amplitude to the vertical and horizontal inputs is no greater than that sufficient to provide full-screen deflection.

WARNING

To avoid electric-shock hazard, do not apply input signals of more than 25 volts (dc plus peak ac).

NOTE

Should fault conditions occur, the instrument is protected for application of input signals up to 100 volts (dc plus peak ac).

With no signals applied to the + Z INPUT and —Z INPUT connectors, the intensity of the display is controlled only by the front-panel INTENSITY control. To control the intensity with an externally applied signal, set the INTENSITY control to about midrange, and apply the input signal to the proper Z INPUT connector.

CAUTION

Be careful to set the proper display intensity; a high-amplitude Z-axis input signal, combined with an excessively high setting of the INTENSITY control, may damage the crt phosphor.

The input signal required for maximum display intensity, through the +Z INPUT connector, is set at the factory for + 1 volt or less. The input signal required to visually cut off the display intensity through the +Z INPUT connector is set at the factory for — 1 volt or less. The best transient response of the Z-Axis Amplifier is achieved when the input signal is the minimum required to provide the desired intensity change.

Input Attenuation

The Horizontal (X) Amplifier and Vertical (Y) Amplifier input circuits include a selectable 1X or 5X attenuator, which is set for 1X operation when shipped from the factory. The Z-Axis Amplifier input circuit can also be modified to provide a range of input impedance and attenuation. The desired input attenuation should be selected by qualified service personnel only.

Remote Program Connector

The REMOTE PROGRAM connector, located on the rear panel, provides direct connections to the + inputs of the Horizontal (X), Vertical (Y), and the Z-Axis amplifiers from a remote location. Also, erase, non-store and save-storage operation can be controlled from a remote location; however, the front-panel controls of the instrument override the remote inputs. All inputs and outputs are TTL compatible. See Figure 2-3 for additional details.

NOTE

Normal remote input requires a logical 0 level of +0.48 volt or less. This level should be satisfied by the TTL output levels, providing the loading rules of the TTL output device are observed.

If low logic levels (i.e., between +0.48 and +0.8 volt) are to be applied to the 607 REMOTE PROGRAM connector inputs, internal circuit modifications may be required. Refer qualified service personnel to the servicing information sections of the 607 Instruction Manual for instructions.

REMOTE ERASE. Stored display will be erased when a remote contact is closed to ground, or logical 0 (TTL) is applied.

REMOTE NON-STORE. Grounding the remote contact or applying a logical 0 (TTL) allows the storage crt to operate in the non-store mode.

REMOTE SAVE. Grounding the remote contact or applying a logical 0 (TTL) places the 607 in the save mode. The front-panel PERSISTENCE/SAVE TIME control sets the save time.

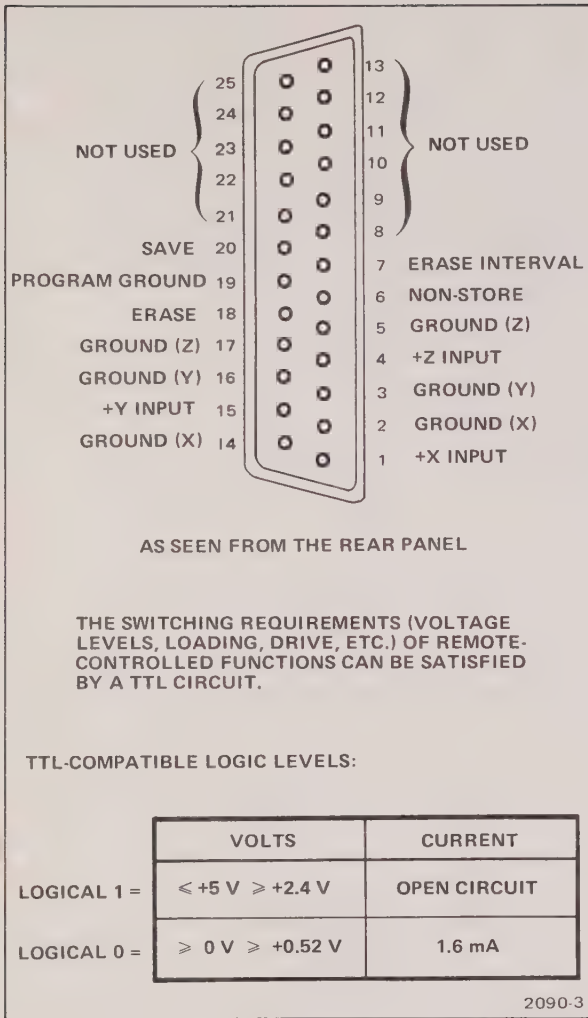


Figure 2-3. REMOTE PROGRAM connector data.

ERASE INTERVAL. During the erase interval, a negative-going pulse, logical 0 (TTL), is present at this contact. This can be used to notify associated equipment that information stored on the 607 crt is being erased.

Care of Storage Screen

The following precautions will prolong the useful storage life of the crt used in this instrument:

1. Use the minimum beam intensity required to produce a clear, well-defined display. Excessive beam intensity may permanently damage the crt, particularly if a bright spot is allowed to remain stationary on the display area.

2. Avoid repeated use of the same area of the crt. If a particular display is being stored repeatedly, change the vertical position occasionally to use other portions of the display area.

3. Do not leave a stored display on the crt when it is no longer needed.

4. Operate the instrument in the non-store mode unless storage is required.

Storage Operation

The storage crt allows a display to be retained for a selectable period of time. When the STORE button is out, the instrument operates as a conventional monitor. When the STORE button is in, the instrument operates in the storage mode. Two modes of storage are available: Variable persistence where the persistence of the crt is electrically controlled by the PERSISTENCE/SAVE TIME control; and the conventional storage mode, which allows longer retention of the displayed information. When the PULL TO SAVE switch is pulled out, the length of time the stored image can be retained is greatly extended. A lockout function prevents accidental erasure of the stored display in the save mode.

A stored display is erased by pressing the ERASE button. In the save mode, the erase function is disabled.

NOTE

Crt image contrast and resolution can be improved slightly, at the sacrifice of some background uniformity, by a slight modification to the storage circuit. Refer qualified service personnel to the servicing information sections of the 607 Instruction Manual for the procedure to improve image contrast and resolution.

Option 4 Sweep Information

The SEC/DIV switch provides six calibrated sweep rates from 0.1 second to 1 microsecond/division in decade steps (VARIABLE control in the fully clockwise position). The VARIABLE control provides uncalibrated sweep rates between the calibrated settings of the SEC/DIV switch, extending the slowest sweep rate to at least 1 second/division.

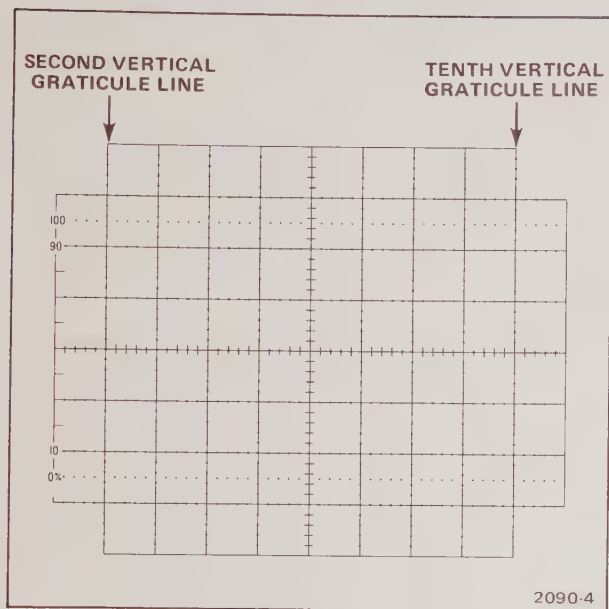


Figure 2-4. Measurement lines on the 607 graticule.

When making time measurements using the graticule, the area between the second and tenth vertical lines provides the most linear measurement. (See Fig. 2-4.) Therefore, the first and last divisions of the display should not be used for making accurate time measurements. Position the start of the display to be measured to the second vertical graticule line. Then set the SEC/DIV switch so that the end of the display measurement section falls between the second and tenth vertical graticule lines.

WARNING

THE REMAINING SECTIONS OF THIS MANUAL CONTAIN SERVICING INSTRUCTIONS. THESE SERVICING INSTRUCTIONS ARE FOR USE BY QUALIFIED PERSONNEL ONLY. TO AVOID ELECTRICAL SHOCK, DO NOT PERFORM ANY SERVICING OTHER THAN THAT CALLED OUT IN THE OPERATING INSTRUCTIONS UNLESS QUALIFIED TO DO SO.

INSTALLATION

OPERATING POWER INFORMATION

This instrument can be operated from either a 120-volt or 220-volt nominal line-voltage source at 48 to 440 hertz. In addition, three regulating ranges are provided for each nominal line-voltage source.

CAUTION

To prevent damage to the instrument, always check the line-voltage information recorded on the rear panel before applying power to the instrument.

Power Cord Information

WARNING

The instrument is intended to be operated from a single-phase, earth-referenced power source having one current-carrying conductor (the Neutral Conductor) near earth potential. Operation from power sources where both current-carrying conductors are live with respect to earth (such as phase-to-phase on a three-wire system) is not recommended, since only the Line Conductor has over-current (fuse) protection within the instrument.

This instrument has a three-wire power cord with a polarized two-pole, three-terminal plug for connection to the power source and safety-earth. The safety-earth terminal of the plug is directly connected to the instrument frame. For electric-shock protection, insert this plug only in a mating outlet with a safety-earth contact. Do not defeat the grounding connection. Any interruption of the grounding connection can create an electric-shock hazard. Before making external connections to this instrument, always ground the instrument first by connecting the power-cord plug to a proper mating power outlet.

TABLE 3-1
Power-Cord Conductor Identification

Conductor	Color	Alternate Color
Line	Brown	Black
Neutral	Light Blue*	White
Safety Earth	Green/Yellow	Green/Yellow

*Tinned copper conductor.

The power-cord plug required depends upon the ac input voltage, and the country in which the instrument is to be used. Refer to the standards listed in Table 3-2 for the recommended power-cord plug configuration for your specific requirements.

TABLE 3-2
Location of Power-Cord Plug Configuration Information

Nominal Line-Voltage	Reference Standards
120 V AC	¹ ANSI C73.11
	² NEMA 5-15-P (Hospital Grade)
220 V AC	ANSI C73.20
	³ AS C112
	⁴ BS 1363
	⁵ CEE 7, sheets IV, VI, and VII
	NEMA 6-15-P

¹ ANSI—American National Standards Institute

² NEMA—National Electrical Manufacturer's Association

³ AS—Standards Association of Australia

⁴ BS—British Standards Institution

⁵ CEE—International Commission on Rules for the Approval of Electrical Equipment

For medical-dental applications, use NEMA 5-15-P (Hospital-Grade) plug for 120-volt operation, or NEMA 6-15-P plug for 220-volt operation.

Line-Voltage and Regulating-Range Selection

CAUTION

Damage to the instrument may result from incorrect placement of the line-voltage selector plug.

To select the correct nominal line voltage and regulating range, proceed as follows:

1. Disconnect the instrument from the power source.
2. Remove the bottom cabinet panel from the instrument, (refer to section 5, Cabinet Panel Removal), to gain access to the Low-Voltage Power Supply board.

3. Insert the proper line-voltage selector plug (brown plug for 120-volt nominal operation or red plug for 220-volt nominal operation) on the Line-Voltage Selector pins labeled for the desired nominal line-voltage range. Refer to Figure 3-1 for location and additional information.

4. Remove the line fuse from the fuse holder located on the rear panel for the standard instrument, or inside the instrument for the Option 6 version (see Fig. 3-1), and replace it with one having the correct rating.

NOTE

An alternate line fuse is supplied from the factory and clipped to the Low-Voltage Power Supply board (see Fig. 3-1).

5. Change the nominal line-voltage information recorded on the 607 rear panel. Use a non-abrasive eraser to remove previous data, and mark on the new data with a pencil.

6. Replace the bottom cabinet panel and apply power to the instrument.

INSTALLATION IN PATIENT-CARE FACILITIES

WARNING

Do not use the amplifier INPUTS for direct-patient connection. Signal currents at these connectors, as well as leakage currents, may exceed values considered non-hazardous for direct-patient connection.

WARNING

Although this monitor is not to be connected directly to a patient, interconnecting this monitor to other equipment can result in the application of excessive current to a patient. It is extremely important that the interconnection is made in accordance with NFPA 76B-T, Tentative Standard for the Safe Use of Electricity in Patient Care Facilities, section 3038, "Signal Transmission Between Appliances".

Among the situations involving the above-mentioned patient hazard is one in which two or more pieces of interconnected equipment are grounded at locations remote from one another. The standard mentioned in the preceding Warning describes both this hazard and appropriate corrective measures.

INPUT ATTENUATION SELECTION

X and Y Input Attenuation

The Horizontal (X) and Vertical (Y) Amplifiers include a selectable 1:1 and 5:1 step attenuator in both the + (non-

inverting) and the — (inverting) input circuits. These attenuators are set in the 1X position when shipped from the factory. When set in the 5X position, these attenuators extend the deflection factor range of the appropriate amplifier to at least 12.5 volts, for full-screen signal deflection. Refer to the Internal Control and Selector Locations pull-out page in section 9, Diagrams and Circuit Board Illustrations, for position settings and location of the attenuator switches.

WARNING

The finned transistor heat sinks on the Horizontal (X) Amplifier are elevated to a maximum of +80 volts. To avoid a potential shock hazard, always turn the instrument power off before changing the X Atten switch settings.

Z-Axis Input Attenuation

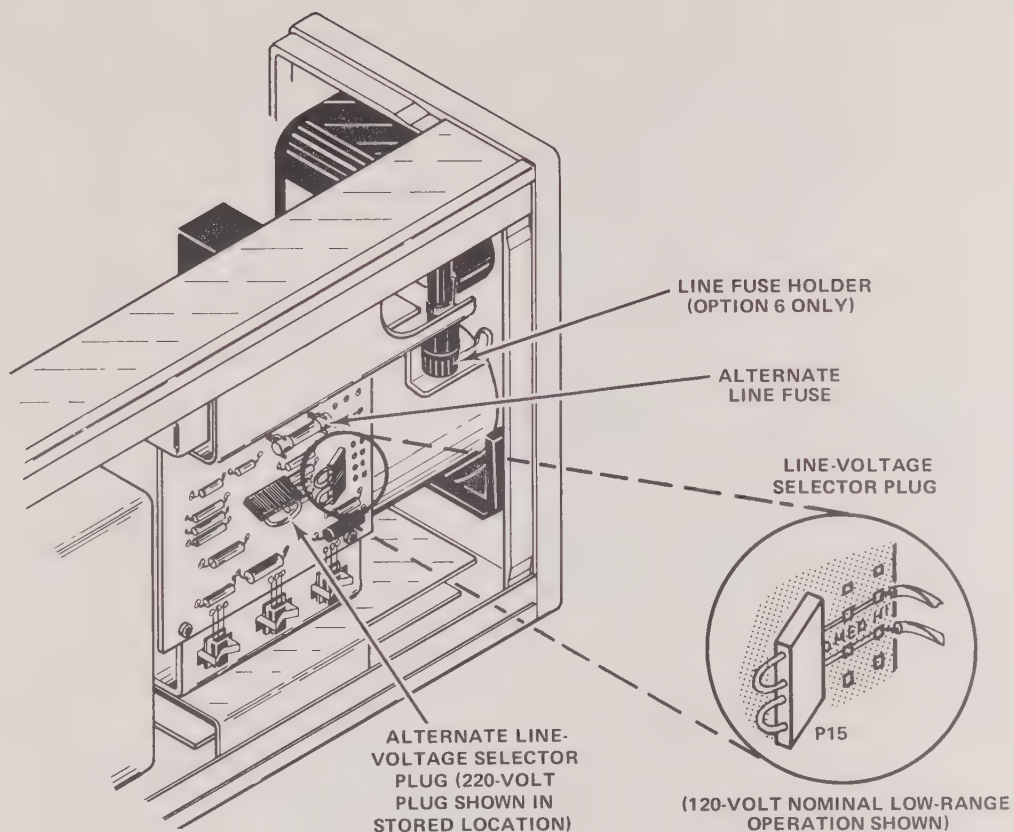
The Z-Axis Amplifier is shipped from the factory with 1X input attenuation and 1 megohm input impedance. However, the attenuation and input impedance can be modified to suit a specific application. Posts on the Z-Axis Amplifier board allow components to be changed without damage to the circuit board. Figure 3-2 illustrates the method used to modify input attenuation and input impedance of the Z-axis input. The same method applies to both the +Z and —Z inputs. Refer to the Internal Control and Selector Locations pullout page in section 9, Diagrams and Circuit Board Illustrations for the location of the Z-axis attenuation components. Refer to your Tketrnix Field Office or representative for additional information.

IMAGE CONTRAST AND RESOLUTION

When in the store mode, a uniformity ramp signal from the Variable-Persistence Pulse Generator improves the crt storage area background uniformity at the sacrifice of some image contrast and resolution. A slight improvement in image contrast and resolution can be obtained with some loss of background uniformity by removing jumper wire W988 on the Storage board (see the Internal Control and Selector Locations pullout page in section 9, Diagrams and Circuit Board Illustrations).

REMOTE PROGRAM INPUTS

REMOTE PROGRAM connector input logic level requirements are discussed in section 2, Operating Instructions. However, if low logic levels (i.e., between +0.48 and +0.8 volt) are to be applied to the REMOTE PROGRAM connector inputs, it may be necessary to replace current-limiting resistors R802, R852, R860, and R912 (located on the Storage board) with jumpers. Although this modification allows the use of logic levels outside the normal limits, the current surge protection provided by these resistors is not available. See the Internal Control and Selector Locations pullout page in section 9, Diagrams and Circuit Board Illustrations, for the jumper locations.



Regulating Ranges

Line-Voltage Selector Position	Regulating Range and Fuse Data	
	120 Volts (Nominal)	220 Volts (Nominal)
LO	90 V ac to 110 V ac	180 V ac to 220 V ac
MED	99 V ac to 121 V ac	188 V ac to 242 V ac
HI	108 V ac to 132 V ac	216 V ac to 250 V ac
Line Fuse Data	0.7 A slow-blow	0.4 A slow-blow

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Figure 3-1. Location of Line-Voltage Selector plugs, regulating-range pins, and line fuses.

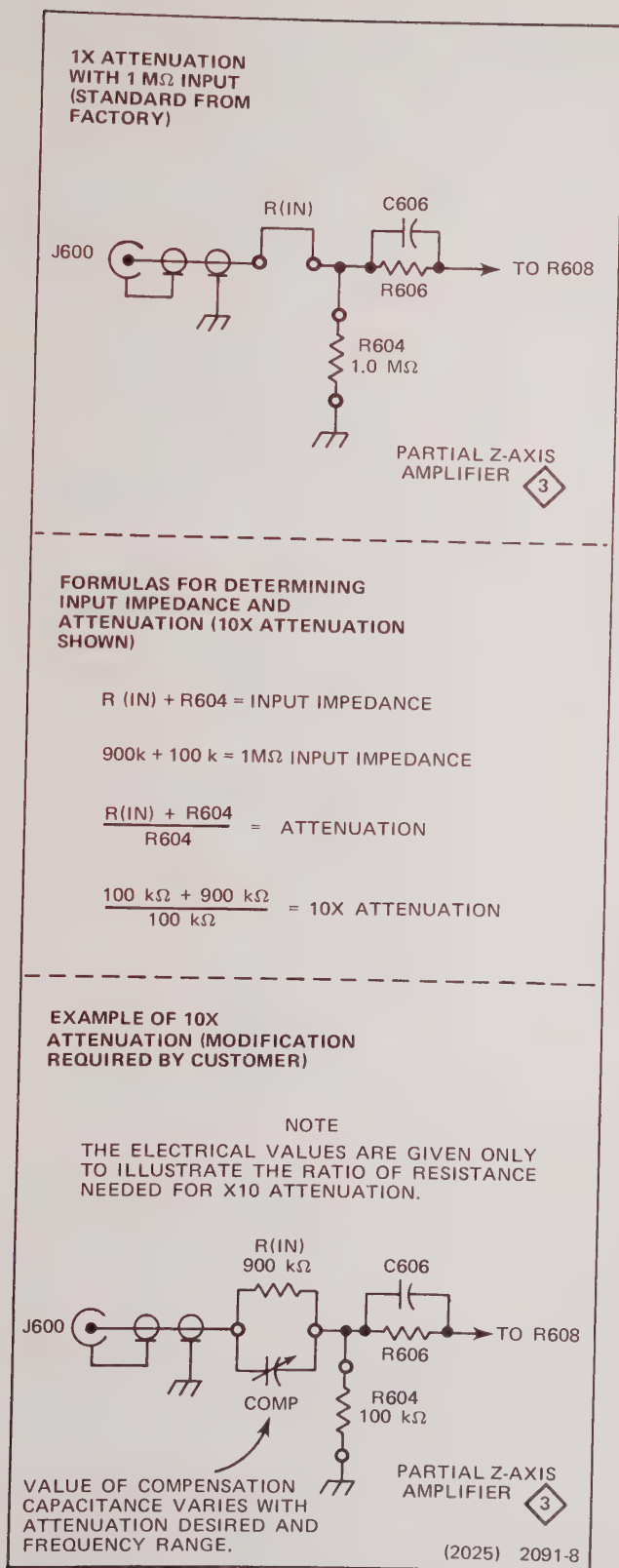


Figure 3-2. Typical method for modifying Z-axis input impedance and attenuation.

CONNECTING THE INTERNAL SWEEP (OPTION 4)

Internal switches are provided to internally connect the optional sweep generator circuit to the Horizontal (X) Amplifier. Remove the left and right side panels (see Cabinet Panel Removal procedures in section 5, Maintenance) to gain access to the switches. Refer to the Internal Control and Selector Locations pullout page in section 9, Diagrams and Circuit Board Illustrations, for the locations of the appropriate switches. Proceed as follows:

1. Set S220 (Int Swp) located on the Deflection Amplifier board to the Y-T (up) position.
2. Set S735 (Int Blank) located on the Z-Axis Amplifier board to the Y-T (right) position.
3. Set S1109 (Trig Mode) located on the Sweep board to the Auto (rear) position.
4. Replace the left and right side panels.

RACKMOUNTING INFORMATION

The 607 can be operated in a standard 19-inch instrument rack with front and rear holes that conform to universal hole spacing. Kits are available to convert the 607 from the cabinet to a rackmounted configuration, and vice versa. Detailed rackmounting instructions are included in the kits. The following is a brief description of each conversion kit available. Consult your Tektronix Field Office or representative for additional information.

Cabinet to Rackmount Conversion

TEKTRONIX PART 040-0600-00. Mounts two 607 Storage Monitors side-by-side in a standard 19-inch wide rack. The kit comes equipped with a slide-out assembly and includes the securing hardware. Complete rackmounting instructions are included with each kit.

TEKTRONIX PART 040-0601-00. Mounts one 607 Storage Monitor in a standard 19-inch wide rack. The kit is equipped with a slide-out assembly, securing hardware, and a blank front panel to cover the second instrument opening in the rack. Complete rackmounting instructions are included with each kit.

TEKTRONIX PART 040-0624-00. Converts one TM 503 Power Module and one 607 Storage Monitor to mount side-by-side in a standard 19-inch wide instrument rack. The kit includes a slide-out assembly and securing hardware. Complete rackmounting instructions are included with each kit.

TEKTRONIX PART 016-0337-00. Converts one 607 Storage Monitor and one 602 Monitor or one 528 Waveform Monitor to rackmount side-by-side in a standard 19-inch rack. The kit includes a slide-out assembly, securing hardware, and blank panel for mounting only one instrument in the rack. Complete rackmounting instructions are included in the kit.

Rackmount to Cabinet Conversion

TEKTRONIX PART 040-0602-00. Converts one 607 Storage Monitor from a rackmount configuration to a cabinet configuration. Complete instructions are included with each kit.

Instrument Dimensions

Figure 1-1 shows the major dimensions of the 607. A detailed dimensional drawing is shown on the Detailed Dimensional Drawing pullout page in section 9, Diagrams and Circuit Board Illustrations.

Slide-Out Tracks Information

The slide-out tracks provided in the conversion kits permit this instrument to be extended out of the rack for maintenance without removing it from the rack. Be sure the power cord and signal cables are long enough to allow operation in the extended position. Refer to the instructions in the appropriate rackmount kit for additional information.

Removing or Installing the Instrument

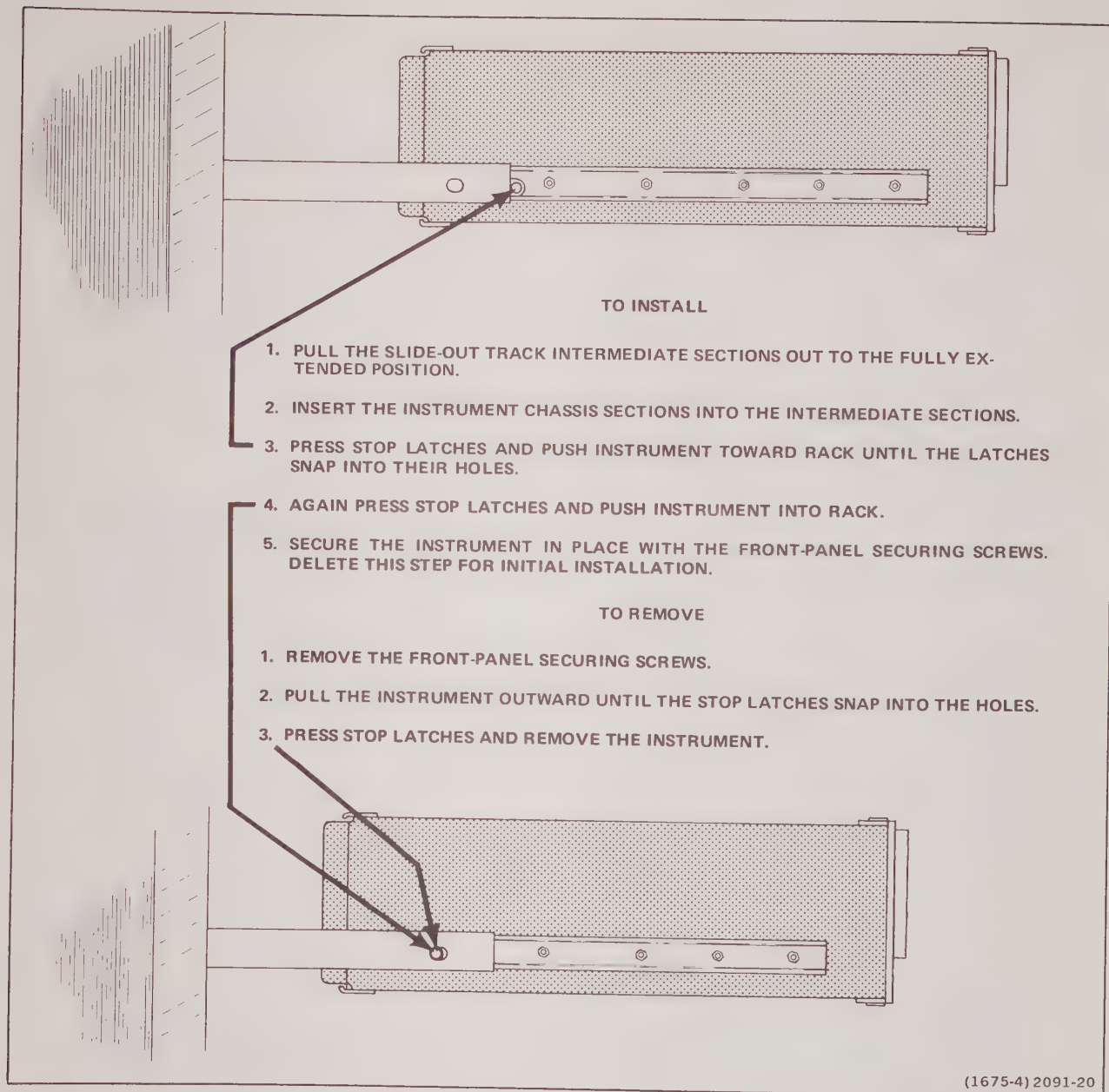
After initial installation and adjustment of the slide-out tracks, the instrument can be removed or installed by following the instructions given in Figure 3-3 (see next page). No further adjustments are required under normal conditions.

Slide-Out Track Lubrication

The special finish on the sliding surfaces of the tracks provides permanent lubrication. However, if the tracks require additional lubrication, a thin coat of paraffin can be rubbed onto the sliding surfaces.

Ventilation Requirements

When the 607 Storage Monitor is mounted in a rack with other equipment, it is important that the temperature surrounding the monitor does not exceed $+50^{\circ}\text{C}$. Additional clearance or forced ventilation methods (fan) may need to be employed to maintain the ambient temperature below $+50^{\circ}\text{C}$. Reliability and performance will be adversely affected if the monitor is operated at an ambient temperature higher than $+50^{\circ}\text{C}$.



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Figure 3-3. Installing and removing a rackmounted instrument.

THEORY OF OPERATION

This section of the manual contains a brief block-diagram description and a detailed circuit description of the 607 Storage Monitor. An overall block diagram and schematic diagrams of each major circuit are provided on pullout pages in section 9, Diagrams and Circuit Board Illustrations. Refer to these diagrams throughout the following discussion to aid in understanding the circuit operation.

BLOCK DIAGRAM DESCRIPTION

Vertical and horizontal signals to be displayed on the crt are applied to the Horizontal (X) and Vertical (Y) Amplifiers through the appropriate + (noninverting) and – (inverting) input connectors. Input signals can be either single-ended or differential. The Horizontal (X) and Vertical (Y) Amplifiers process the input signals and provide push-pull outputs to drive the deflection plates of the crt. Both amplifiers contain position, gain, and step attenuation controls.

The Z-Axis Amplifier controls the display intensity by providing a voltage to drive the crt control grid. Input signals applied to the +Z (noninverting) and –Z (inverting) INPUT connectors may be either single-ended or differential.

The Storage Control circuit includes the Erase-Pulse Generator for erasing stored information and a Variable-Persistence Pulse Generator for varying the crt phosphor persistence. Also provided are erase, save, and non-store input and erase interval output gate stages which allow remote operation through the REMOTE PROGRAM connector.

The Storage Output circuit consists of the Storage Mesh Amplifier stage and the regulators for the collimation and flood-gun anode and cathode electrodes. These stages provide the voltage levels necessary to operate the crt storage elements.

The High-Voltage and Low-Voltage Power Supplies provide all the voltages necessary for operation of this instrument.

The optional Sweep circuit produces a positive-going sawtooth voltage, which is amplified by the Horizontal (X) Amplifier, to provide horizontal sweep deflection. The level of the vertical signal at which triggering occurs is determined by the TRIG SLOPE/LEVEL control. The Sweep circuit also produces an unblanking gate signal coincident with the sawtooth waveform which unblanks the crt to permit display presentation.

DETAILED CIRCUIT OPERATION

Complete schematic diagrams are provided in section 9, Diagrams and Circuit Board Illustrations. The number inside the diamond after a heading in the following discussion refers to the schematic diagram for that circuit. The schematic diagrams contain shaded borders around the major circuits to conveniently locate the circuits and components mentioned in the following discussion.

VERTICAL (Y) AMPLIFIER

The Vertical (Y) Amplifier provides a push-pull output suitable to drive the crt deflection plates. Input signals can be applied either single-ended or differentially.

Input

Signals can be applied to either J400 (+Y INPUT) or J500 (–Y INPUT) as single-ended inputs, or to both connectors as a differential input. Also, a signal can be applied via pin 15 of J20 (rear-panel REMOTE PROGRAM connector) to the +Y input. Internal attenuator switches S400 (+Y Atten) and S500 (–Y Atten) allow a choice of either 1X or 5X attenuation of the input signal before it is applied to the

gate(s) of FET (field-effect transistor) Q410. The input 5X attenuators are frequency-compensated voltage dividers.

Preamplifier

The Preamplifier employs a dual FET to provide a high input impedance. This stage consists of two identical feedback amplifiers, Q410A-Q420 and Q410B-Q520, which can be operated as either a paraphase amplifier (with single-ended input) or as a differential amplifier. A push-pull signal is produced at the collectors of Q420 and Q520. The FET gates are diode-clamped on negative-going overdrive signals to protect the field-effect transistors from excessive input voltages. Variable resistor R415 (Y Gain) provides an adjustable amplification factor to allow a crt full-scale

deflection range of at least 0.5 volt to 2.5 volts. This control is normally set to a nominal 1 volt for 8 divisions of deflection.

Output Amplifier

The Output Amplifier consists of two identical non-inverting operational amplifiers connected in a differential configuration. Transistors Q432 and Q532 provide bias current for input transistors Q430 and Q530. Transistors Q430 and Q530 amplify the push-pull signal from the Preamplifier stage. The amplified signal is fed to emitter followers Q460 and Q560, which drive Q464 and Q564.

The bases of Q460 and Q560 are diode limited to ensure quick overdrive recovery. The output signal at the collectors of Q464 and Q564 causes a change in the current through feedback resistors R450 and R550 that just balances the current through R442 due to the input signal. Thus the current in Q430 and Q530 is held nearly constant.

Display vertical positioning is accomplished by R440, which provides a shift in constant-current source transistors Q432 and Q532 to change the quiescent output voltage. Capacitor C446 (Y HF Comp) provides frequency compensation. Custom bandpass limiting can be provided by connecting a selected capacitor between the bases of Q430 and Q530.

HORIZONTAL (X) AMPLIFIER

The Horizontal (X) Amplifier provides a push-pull output suitable to drive the crt deflection plates. Input signals can be applied either single-ended or differentially.

Input

Input signals can be applied to either J200 (+X INPUT) or J300 (−X INPUT) as single-ended inputs, or to both connectors as a differential input. Also, a signal can be applied via pin 1 of J20 (rear-panel REMOTE PROGRAM connector) to the +X input. Internal attenuator switches S200 (+X Atten) and S300 (−X Atten) allow a choice of either 1X or 5X attenuation of the input signal before it is applied to the gate(s) of field-effect transistor Q210. The input 5X attenuators are frequency-compensated voltage dividers.

Preamplifier

The Preamplifier employs a dual FET to provide a high input impedance. This stage consists of two identical feedback amplifiers, Q210A-Q220 and Q210B-Q320, which can be operated as either a paraphase amplifier (with single-ended input) or as a differential amplifier. A push-pull signal is produced at the collectors of Q220 and Q320. The FET gates are diode-clamped on negative-going overdrive signals to protect the field-effect transistors from excessive input voltages.

Variable resistor R215 (X Gain), provides an adjustable amplification factor to allow a crt full-scale deflection range of at least 0.5 volt to 2.5 volts. This adjustment is normally set to a nominal 1 volt for 8 divisions of deflection.

Output Amplifier

The Output Amplifier consists of two identical non-inverting operational amplifiers connected in a differential configuration. Transistors Q232 and Q332 provide bias current for input transistors Q230 and Q330. Transistors Q230 and Q330 amplify the push-pull signal from the Preamplifier stage. The amplified signal is fed to emitter followers Q260 and Q360 which drive Q264 and Q364. The bases of Q260 and Q360 are diode limited to ensure quick overdrive recovery. The output signal at the collectors of Q264 and Q364 causes a change in the current in feedback resistors R250 and R350 that just balances the current in R242 due to the input signal. Thus, the current in Q230 and Q330 is held nearly constant.

Display horizontal positioning is accomplished by R240, which causes a shift in constant-current source transistors Q232 and Q332 to change the quiescent output voltage. Capacitor C246 (X HF Comp) provides frequency compensation. Custom bandpass limiting can be provided by connecting a selected capacitor between the bases of Q230 and Q330. Switch S220 (Int Swp), in the Option 4 version, permits connecting the Preamplifier to the Output Amplifier (X-Y position) for external sweep operation or disconnecting the Preamplifier and connecting the Sweep Generator output to the Output Amplifier input for internal sweep operation.

Z-AXIS AMPLIFIER

Input

Signals can be applied to either J600 (+Z INPUT) or J650 (−Z INPUT) as single-ended inputs, or to both connectors as a differential input. Also, a signal can be applied via pin 4 of J20 (rear-panel REMOTE PROGRAM connector) to the +Z input. A provision is made on each input line to permit installation of attenuating resistors.

Preamplifier

The Z-Axis Preamplifier employs a dual FET, Q610, to provide a high input impedance. The stage consists of two identical feedback amplifiers, Q610A-Q620-Q630 and Q610B-Q670-Q680, which can be operated as either a paraphase amplifier (with a single-ended input) or as a differential amplifier. A single-ended output is produced at the collector of Q680 which is in phase with the signal applied to the +Z INPUT connector, and opposite in phase to the signal applied to the −Z INPUT connector. Additional bias current for the stage is supplied by Q640. The FET gates are diode-clamped on negative-going overdrive signals to protect the field-effect transistors from excessive input

voltages. Potentiometer R615 (Z Gain) provides an adjustable amplification factor to provide a maximum allowable crt grid drive when a signal of at least +1 volt to +5 volts is applied to either the +Z or -Z INPUT connector, and R175A (INTENSITY) is set to about midrange. Under this condition, a zero-volt input cuts off the intensity to below the visible level.

Output Amplifier

The Output Amplifier is a non-inverting operational amplifier consisting of Q690, Q710, Q720, and Q724. The feedback resistor is R734 while C734 (Z HF Comp) provides a means of adjusting the amplifier response. Transistors Q720 and Q724 are connected as a collector-coupled complementary amplifier to provide a fast, linear output signal while consuming minimum quiescent power. The quiescent output level can be set by potentiometer R175A (INTENSITY). The output is applied to the crt control-grid circuit.

To prevent writing over information being saved in the stored mode, Q700 disables the Z-Axis Amplifier when the save mode is enabled.

HIGH VOLTAGE

High-Voltage Regulator

HIGH-VOLTAGE PRIMARY. A repetitive, sinusoidal signal is produced by a regenerative feedback oscillator in the primary of T120 and induced into the secondary. Current drive for the primary winding is furnished by Q130 and Q132. The conduction of Q130 and Q132 is controlled by the output voltage of Q110.

HIGH-VOLTAGE REGULATION. Regulation is accomplished by comparing a sample of the -1500 volts with a sample of the regulated +15 volts from potentiometer R100 (HV Adj) and divider network R104A-R104B to the positive input (pin 3) of U110. If the output level of the Cathode Supply goes above the nominal -1.5 kilovolts (i.e., goes more negative), the positive input (pin 3) of U110 goes negative from its quiescent +1.2 volts. The output of U110 then goes less positive to reduce the conduction of Q130 and Q132. This reduces the peak-to-peak sinusoidal signal amplitude, resulting in a reduced voltage across the secondary of T120. Conversely, if the output drops below -1.5 kilovolts (i.e., goes more positive), Q130 and Q132 will conduct harder (i.e., have a larger sinusoidal signal amplitude). Transistor Q390 protects the High-Voltage Power Supply, in the event the output is shorted, by limiting the maximum current drawn by high-voltage oscillator Q130 and Q132.

High-Voltage Outputs

The secondary winding of T120 provides the negative and positive accelerating potentials for the crt, the bias voltage

for the control grid, the +80-volt and +170-volt supply voltages used elsewhere in the 607, and the crt writing-gun filament voltage.

Positive accelerating voltage for the crt anode is supplied by voltage tripler U120. The applied voltage to the input of the tripler from the T120 secondary winding is about +3.5 kilovolts peak. The output voltage of the tripler is about +10.5 kilovolts at the crt anode. The negative accelerating voltage for the crt cathode is also obtained from the T120 secondary winding. Diode CR150 rectifies the transformer output and supplies the -1.5 kilovolts to the crt cathode. Crt writing-gun filament voltage is provided by a winding on the secondary of T120 which is elevated to -1.5 kilovolts.

Control-Grid DC Restorer

The Control-Grid DC Restorer couples the dc and low-frequency components of the Z-Axis Amplifier output signal to the crt control grid. This allows the Z-Axis Amplifier to control the crt beam intensity. The potential difference between the Z-Axis Amplifier output level and the crt control grid (about -1600 volts) prohibits direct coupling.

The Control-Grid DC Restorer is actually a cathode-referenced bias supply for the crt control grid. Quiescently, its output voltage is more negative than the crt cathode by an amount determined by the Z-Axis Amplifier output level and the setting of R192 (Cutoff). (The cutoff voltage at the crt control grid is typically about 100 volts more negative than the crt cathode level.)

NOTE

A simplified diagram of the Control-Grid DC Restorer is shown in Figure 4-1. The voltages given on this diagram are idealized levels and will not necessarily be the same as those found in the actual instrument.

The Control-Grid DC Restorer is divided into two sections in this description for ease of explanation. The first section can be considered a Modulator at low-voltage potentials and the remaining section as a Demodulator at high-voltage potentials.

MODULATOR. When the secondary-winding output of T120 (pin 11) swings positive, C186 charges through R150 and C150 to a voltage level determined by the setting of R192 (Cutoff). At this voltage level (approximately 110 volts), CR186 conducts, preventing any additional increase in positive voltage across C186. When the secondary-winding output swings negative, CR186 turns off. Then CR148 conducts and clamps the negative excursion at C186

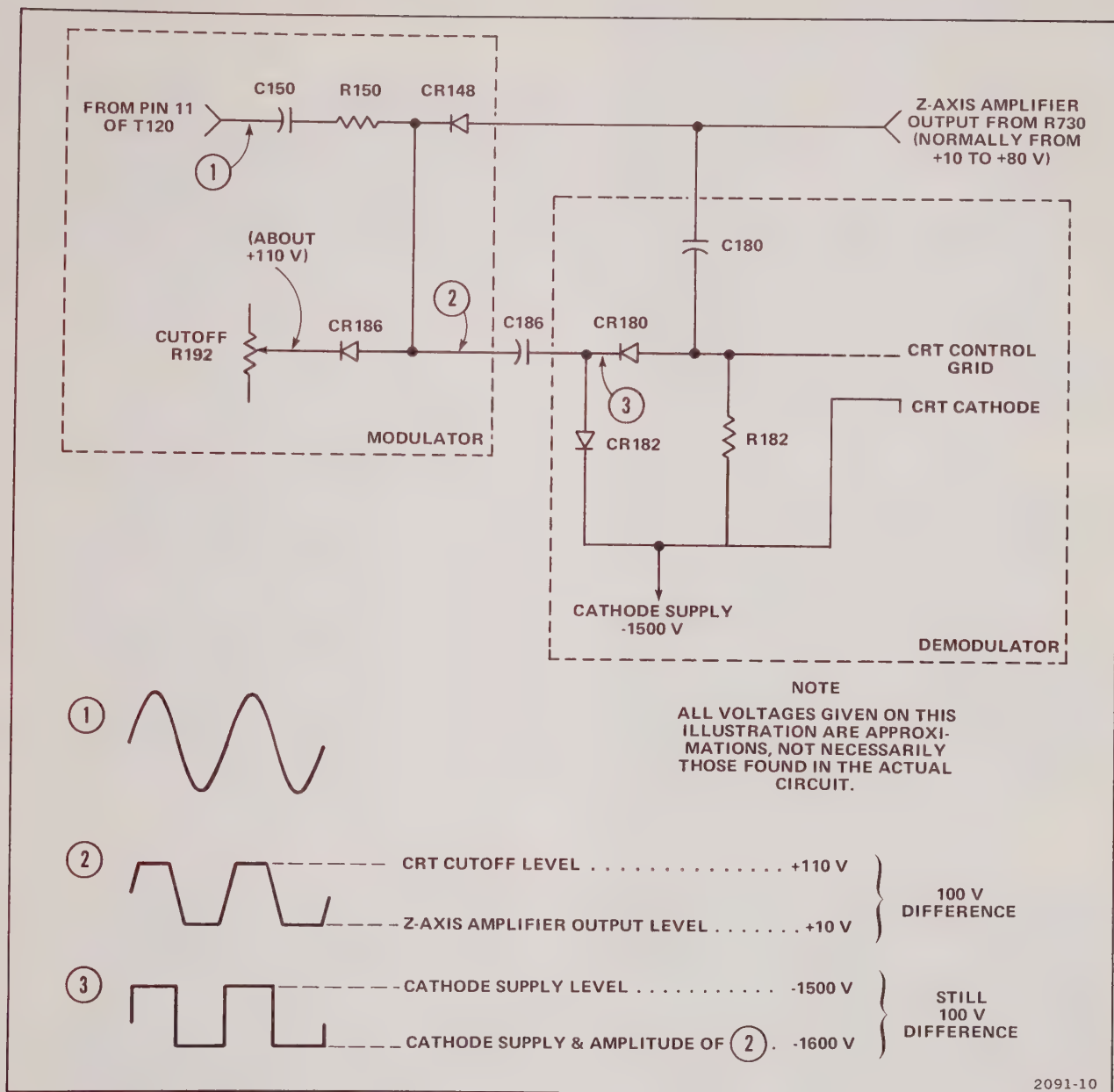


Figure 4-1. Simplified diagram of DC Restorer circuit.

to the voltage level of the Z-Axis Amplifier output. The result is a square-wave output from the Modulator, with the amplitude determined by the difference between the Z-Axis Amplifier output level and the setting of R192 (Cutoff). (See waveform 2 on Fig. 4-1.) This square wave is coupled through C186 to the Demodulator.

DEMODULATOR. The Demodulator rectifies the signal from the Modulator and references it to the crt cathode supply level. The positive swing of waveform 3 (see Fig. 4-1) is limited by CR182 to the Cathode Supply level while the negative excursion is coupled through CR180 to C180. Quiescently, C180 will charge to about -1500 volts through R182. After repetitive cycles from C186, C180 will charge to the negative level of waveform 3. Capacitor C180 holds the voltage constant at the crt control grid, and also provides a path for the ac portions of the Z-Axis Amplifier output signal to be coupled to the crt control grid.

The remainder of the components not shown in the simplified diagram provide protection for the active components and the Z-Axis Amplifier in the event of a high-voltage arc or other malfunction.

CRT Control Circuits

In addition to the INTENSITY control discussed previously, a front-panel FOCUS control and internal Astig adjustment have been incorporated for obtaining an optimum crt display. Potentiometer R175B (FOCUS) provides the correct voltage for the second anode in the crt. Proper voltage for the third anode is obtained by adjusting potentiometer R170 (Astig). In order to obtain optimum spot size and shape, both R175B (FOCUS) and R170 (Astig) are adjusted to provide the proper electrostatic lens configuration in the crt.

Potentiometer R165 (Geom) varies the positive level on the horizontal deflection plate shields to control the overall geometry of the display. Potentiometer R145 (TRACE ROTATION) permits adjustment of the dc current through beam-rotation coil L145 to align the display horizontally.

Potentiometer R173 (Y-Axis Align) varies the dc current through beam rotation coil L172 to align the crt vertical (Y) axis. Beam-rotation coil L172 is located between the vertical and horizontal deflection plates to allow rotation of the vertical (Y) axis only.

STORAGE CONTROL AND OUTPUT

Storage Cathode-Ray Tube

The cathode-ray tube (crt) is a standard transmission half-tone storage tube. The collector mesh is a coarse mesh that

accelerates electrons toward the target area. The target (storage mesh) is a fine mesh with a highly insulative dielectric layer deposited on it. Storage occurs in the dielectric layer. The flood guns cover the entire storage target with a continuous stream of low-velocity electrons that are prevented from reaching the phosphor screen unless a display has been written on the storage mesh.

Erase-Pulse Generator

The Erase-Pulse Generator consists of three timing circuits. The timing circuit outputs are summed together to form the composite erase pulse that appears on the storage mesh (see Fig. 4-2). T1, (the 50-millisecond, approximately 120-volt pulse) is derived from monostable multivibrator U820. T2, which is formed by RC network R838, C840, and switching transistor Q835, returns the storage mesh to the 0-volt level for approximately 10 milliseconds at the end of T1. T3, which is determined by U850 and is initiated at the start of T1, maintains control over the storage mesh after T1 and T2 have passed and sets the storage mesh preparation level for the remainder of the erase cycle. The T1, T2, and T3 signals control diode gates CR950, CR952, CR954, CR956, CR960, and CR962 which in turn supply the control currents to the summing point at the base of Q1060 in the Storage Mesh Amplifier stage.

The output of U810B is used to trigger U820 to initiate an erase cycle. If S870 (ERASE) is held depressed longer than one erase cycle, the erase cycle will repeat, thereby generating multiple erase cycles to clear the crt of such problems as residual images.

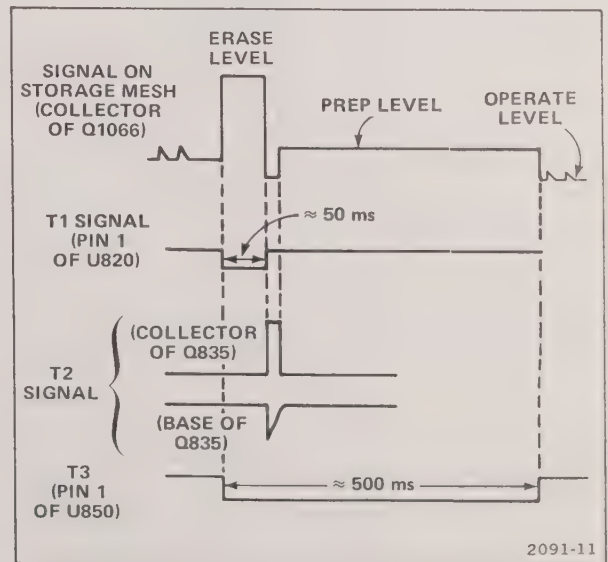


Figure 4-2. Idealized waveform ladder showing the outputs of the Erase Pulse Generator.

When an erase cycle is initiated, pin 1 of U850 goes low and causes C890 to discharge through CR890. When pin 1 of U850 returns positive (at the end of the erase cycle), and if S870 (ERASE) is still depressed, C890 momentarily pulls pin 6 of U810B positive, then recharges negative because of the current in R870. As U810B pin 6 swings to its low level, the output of U810B pin 4 goes high again and triggers U820. This cycle will repeat as long as S870 (ERASE) is held depressed. Multiple erase cycles cannot be obtained when using the remote erase feature.

Pin 6 of U850 drives Erase Interval Output Gate U810A to generate an Erase Interval Out signal at pin 7 of J20 (REMOTE PROGRAM). The output from U850 is also used as a lockout signal for U820 and U895 during the erase cycle.

Transistor Q810, along with C810 and R810, form a circuit to initiate an erase cycle whenever the 607 storage mode is changed from store to non-store.

Variable-Persistence Pulse Generator

Transistors Q872 and Q876 are connected as a relaxation oscillator that generates sharp positive pulses (see Fig. 4-3) at a 100-hertz rate. The timing components for the relaxation oscillator are R875 and C886. The sharp positive pulses from the emitter of Q876 are used to trigger monostable multivibrator U895. The on time of U895 is controlled by C895, R892, R894, and potentiometer R895 (PERSISTENCE/SAVE TIME). The output of U895 controls diode gates CR973 and CR975, which subtract current from the summing point at the base of Q1060 in the Storage Mesh Amplifier, thus modulating the storage mesh. The amount of current to be subtracted is set by potentiometer R975 (Pulse Ht).

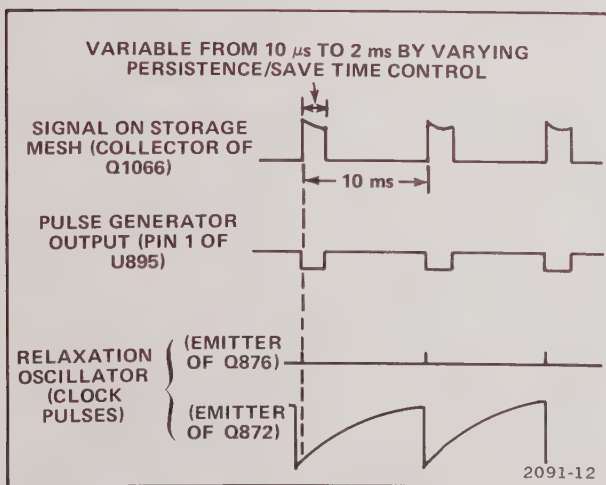


Figure 4-3. Idealized waveform ladder showing the output and internal clock pulses of the Variable-Persistence Pulse Generator.

Turning R895 (PERSISTENCE/SAVE TIME) fully counterclockwise (maximum persistence position) closes S895A and grounds the output of the relaxation oscillator through R882, thereby preventing U895 from being triggered.

Pulling the PERSISTENCE/SAVE TIME knob out to the save mode causes the output of Save Input Gate U810D to bias CR984 on and CR975 off. Thus, the output of U895 is fed to the flood-gun cathode through CR986. With the output of U895 modulating the flood-gun cathode current instead of the storage mesh, the stored image can now be observed without complete loss of the save feature by adjusting potentiometer R895 (PERSISTENCE/SAVE TIME). The maximum average flood-gun cathode current corresponds to the fully clockwise position (minimum persistence) of potentiometer R895 (PERSISTENCE/SAVE TIME). When potentiometer R895 (PERSISTENCE/SAVE TIME) is fully counterclockwise, U895 is not triggered and the flood-gun cathode current is zero, which results in maximum save time. During the time U895 is not triggered (PERSISTENCE/SAVE TIME control fully counterclockwise), the flood-gun cathode is positive with respect to the flood-gun anode level (i.e., approximately +35 volts) and no flood-gun cathode current flows (Q996 is turned off).

Store/Non-Store Input Gate

The Store/Non-Store Input Gate consists of U810C which initiates an erase cycle each time the storage mode is changed from store to non-store or vice versa.

When the non-store mode is selected, either remotely through pin 6 of J20 (REMOTE PROGRAM) or by releasing S910 (STORE) to the out position, pin 10 of U810C goes high and turns on Q810 in the Erase Pulse Generator. Consequently, pin 6 of U810B goes low and triggers U820 which initiates an erase cycle. After a short time, due to the delay introduced by C904, pin 4 of U820 is then pulled high through CR812 to disable U820 and prevent any additional erase pulses during the erase cycle. The high at pin 10 of U810C also turns on Q990 in the Flood-Gun Cathode Regulator. Transistor Q996 is turned on coincidentally with Q990 for about 50 milliseconds by the erase pulse from pin 6 of U820 through R1000 and CR1000. Thus, cathode current flows and the crt phosphor is flooded with electrons for 50 milliseconds. After 50 milliseconds, Q990 turns Q996 off and R998 holds the flood-gun cathode positive with respect to the flood-gun anode which stops the flow of cathode current.

When the store mode is selected by pushing S910 (STORE), pin 10 of U810C goes low and pulls pin 6 of U810B low through CR814 and C814, thereby initiating an erase cycle. Capacitor C814 then charges through R806 which allows pin 6 of U810B to return high and enable the Erase Pulse Generator to generate another erase cycle.

Save Input Gate

The Save Input Gate, composed of U810D, disables the Z-Axis Amplifier and the Erase Pulse Generator, and switches the output of the Variable-Persistence Pulse Generator from the Storage Mesh Amplifier to the Flood-Gun Cathode Regulator.

When the save mode is selected, either remotely through pin 20 of J20 (REMOTE PROGRAM) or by pulling out the PERSISTENCE/SAVE TIME knob to close S895B, pin 13 of U810D goes high. Consequently, pin 4 of U820 goes high to disable the Erase Pulse Generator while Q700 in the Z-Axis Amplifier is biased on to disable the Z-Axis Output Amplifier. The high at pin 13 of U810D also biases CR984 on and CR975 off, which feeds the Variable-Persistence Pulse Generator output through CR986 to the base of Q990 in the Flood-Gun Cathode. Thus, the Variable-Persistence Pulse Generator output now modulates the flood-gun cathode current instead of the storage mesh as described in the Variable-Persistence Pulse Generator discussion.

Input-Output Gate Protection

Resistors R802, R852, R860 and R912, and diodes CR801, CR802, CR852, CR853, CR860, CR861, CR910, and CR912 provide limited protection against accidental line transients as an additional voltage drop is introduced.

Storage Element Supplies

The storage-element supply provides operating and control voltages for the storage and flood-gun crt elements.

FLOOD-GUN CATHODE REGULATOR. Transistors Q990 and Q996 form a clamped switching circuit. When Q996 is on, the flood-gun cathode is held at +15 volts and cathode current flows. With Q996 off, R998 holds the flood-gun cathode positive with respect to the flood-gun anode, and no cathode current flows.

FLOOD-GUN ANODE REGULATOR. Transistor Q1010 forms a shunt regulator with the output voltage set by R1014 and R1012 to about +35 volts. During an erase cycle, the flood-gun anode voltage is raised by the added current drawn by R1018. Normally, the additional R1018 current is supplied by pin 1 of U850. However, when the output (pin 1) of U850 goes low for the duration of the erase cycle, CR1018 turns off, CR1016 turns on, and the additional current is then supplied from the summing point (base of Q1010).

COLLIMATION ELECTRODE REGULATORS. Transistor Q1036 with R1034, R1032, and R1030 forms a shunt regulator. Potentiometer R1030 (CE 1) sets the output voltage to collimation electrode 1. When the 607 is changed

from store to non-store mode, Q1026 is momentarily turned on. Consequently, the additional current from the base of Q1036 is switched to ground through R1026 which raises the voltage at collimation electrode 1.

Transistor Q1050 with R1052, R1054, and R1055 form a shunt regulator. Potentiometer R1054 (CE 2) sets the output voltage to collimation electrode 2. Zener diode VR1040 supplies a regulated +135 volts to potentiometer R1042 (CE 3) which sets the output voltage to collimation electrode 3.

STORAGE MESH AMPLIFIER. Transistors Q1060 and Q1066 form an operational amplifier that is used as a current-to-voltage conversion amplifier to control the storage mesh. The output dc level of the amplifier is set by R970 (OPERATE LEVEL) and R965 (Op Level). In addition to the input signals that modulate the supply during the erase cycle and variable persistence modes of operation, an additional input in the form of a modified ramp is made to the summing point (base of Q1060). The modified ramp provides more consistent storage performance and is supplied from relaxation oscillator Q872 and Q876.

LOW VOLTAGE

Power Input

Power is applied to the primary of transformer T15 through fuse F10, thermal cutout S10, power switch S12, and line-voltage selector plug P15 (or P17). The line-voltage selector plug allows changing the primary-winding taps of T15 to fit different line-voltage requirements.

Low-Voltage Rectifiers and Unregulated Outputs

The full-wave bridge rectifiers and associated filter components in the secondaries of T15 provide filtered dc voltages. The unregulated +20-volt output goes to the high-voltage transformer, where it is fuse protected.

Low-Voltage Regulators

+15-VOLT SUPPLY. The +15-Volt Supply, besides providing power to circuitry throughout the instrument, provides a reference-voltage source to establish operating levels for the feedback regulators in the -30-Volt and the +5-Volt Supply. The regulator for the +15-Volt Supply is a feedback amplifier system that operates between ground and the unregulated +20-volts. Current to the load is delivered by series-pass transistor Q30 and the supply voltage is established by the drop across R38, R40, and R42, which is compared to the voltage drops across VR50 and the emitter-base junction of Q50. Any variation in output voltage due to ripple is amplified by Q50 and Q32. The current change through the load is applied to the base of Q30 which maintains a constant output. The output of the supply is set to exactly +15 volts by potentiometer R40 (+15 V). During initial turn on, CR30 biases Q30 on. Sufficient voltage is then developed across shunt resistor R34 to start the High-Voltage Power Supply.

Transistor Q32 protects the supply in the event of a current overload. The overload will cause the voltage across R36 to become high enough to overcome the voltage drops across CR40, CR41 and the base-collector junction of Q32. At this time, Q32 becomes saturated and turns off Q30, thereby current-limiting the supply.

—30-VOLT SUPPLY. The regulator for the —30-Volt Supply consists of series-pass transistor Q70 and error amplifier Q80. This is a feedback amplifier system similar to that just described for the +15-Volt Supply, except that the regulator is located in the return side of the supply instead of the output.

The center of resistive divider network R86 and R88 is set by error amplifier Q80 to be zero volts with respect to ground during normal operation. Any variation in output from the —30-Volt Supply is coupled to the error amplifier, which changes the bias of the series-pass transistor. This change in bias, and the resulting change in conduction of the regulator, alters the voltage at the —30-Volt Supply return, which maintains the —30-Volt Supply at the proper level.

Transistor Q76 protects the —30-volt series regulator Q70 if excess current is demanded from this supply. All current from this supply must flow through R72. When excess current is demanded, the voltage drop across R72 increases enough to forward bias CR74. The resulting current through this diode takes control away from Q80, and will turn on Q76 while turning off Q70, thus limiting the supply current to a safe level.

+5-VOLT SUPPLY. The regulator for the +5-Volt Supply consists of series-pass transistor Q60 and error amplifier Q64. Operation of this feedback amplifier system is similar to that described for the +15-Volt Supply. Current limiting, in the event of an overload, is provided by R56.

SWEEP (OPTION 4)

Trigger and Sweep Generator

The Trigger and Sweep Generator produces a positive-going sawtooth voltage that is amplified by the Horizontal (X) Amplifier to provide sweep deflection in the crt. Six sweep rates are provided in decade steps from 0.1 second through 1 microsecond/division. A negative-going gate is produced at the same time the sawtooth is being produced to unblank the crt.

The Trigger and Sweep Generator is composed of Tektronix-manufactured integrated circuit U1130 and its associated

discrete circuit components. Integrated circuit U1130 contains the trigger generator, the sweep-gating circuit, and an operational amplifier to form the basis of a Miller integrator. Power is applied to pins 7 and 12 to establish the operating levels within the device. An internal reference Zener diode provides 6.4 volts between pins 8 and 9 for operation of external controls; pin 8 provides a level of two diode junctions above the negative level at pin 12.

The timing components are selected by S1130 (SEC/DIV) which permits one of six nominal sweep rates to be chosen. Potentiometer R1145 (VARIABLE) adjusts the timing current to provide a continuously variable sweep rate.

Pins 10, 11, 13, and 14 are associated with the Trigger Generator portion of U1130. The triggering signal is applied to a field-effect transistor (FET) input at pin 13. Potentiometer R1118 (TRIG SLOPE/LEVEL) at pin 14 controls the internal comparators that determine the level and slope at which the internal Schmitt multivibrator switches states, initiating a sweep trigger. Differentiating capacitor C1112 at pin 11 determines the trigger-pulse width.

For normal triggered operation, —8.2 volts is applied to pin 10 to hold the bright-baseline auto circuit inactive. In this mode, when the triggering signal is lost, a sweep cannot be produced. When internal switch S1109 (Trig Mode) is set to Auto, the —8.2 volts is disconnected to permit a free-running sweep, or bright baseline, to be produced. Pin 10 moves positive as C1110 charges, and this positive potential then acts as the triggering signal. A new sweep will be initiated immediately following the sweep hold-off time. However, with S1109 (Trig Mode) in the Auto position, any incoming triggering signal will discharge C1110. If the signal is occurring at a rate greater than about 20 hertz, C1110 will be held below the auto-trigger level to permit a triggered sweep to be produced.

Pins 1 through 6 and pin 16 are associated with the Sweep Generator portion of U1130. Upon receipt of a trigger from the Trigger Generator, the sweep gate turns on. While the gate is on, CR1130 is turned off by a high logic level at pin 2, allowing the current through external R_t components R1130 and R1146 to be switched to timing capacitors C1130 and C1138. Pin 5 is the operational amplifier null point, thus the nearly constant timing current charges the capacitors linearly, producing a linear, negative-going sawtooth voltage at pin 4. When the sawtooth reaches a level determined by R1115 (Swp Length), the sweep terminates. At this point, the sweep gate turns off, turning on CR1130 and quickly discharging the timing capacitors. A short-duration trigger-lockout period, (to allow the sweep generator to reset and stabilize), is provided by C1124 and C1125 at pin 3.

Sawtooth Amplifier

Operational amplifier system Q1160 and Q1164 provides amplification of the sweep sawtooth to a suitable amplitude to meet the sensitivity requirements of the Horizontal (X) Amplifier. Potentiometer R1165 (Swp Cal) permits calibrating the sweep to the crt graticule. The base of Q1160 is the null point, R1150 is the R_{in} element, and R1155 is the feedback element. A positive-going sawtooth is produced at the emitter of Q1164.

Unblanking-Gate Output Amplifier

The negative-going gate produced at pin 16 of U1130 is amplified by Q1175 and Q1178. The negative-going gate produced at the collector of Q1178 is applied to R735 in the Z-Axis Amplifier circuit to turn on the crt during the sweep.

MAINTENANCE

This section of the manual contains information for performing preventive maintenance, troubleshooting, and corrective maintenance for the 607 Storage Monitor.

PREVENTIVE MAINTENANCE

Preventive maintenance, when performed on a regular basis, can prevent instrument breakdown and may improve the reliability of the instrument. The severity of the environment to which the instrument is subjected will determine the frequency of maintenance. A convenient time to perform preventive maintenance is preceding electrical adjustment of the instrument.

CABINET PANEL REMOVAL

WARNING

Disconnect power to the instrument before removing the cabinet panels to avoid electric-shock hazard.

The cabinet panels are held in place by slotted fasteners. To remove the panels, turn each fastener counterclockwise a quarter turn with a large screwdriver. Lift the panels away. Always operate the instrument with the panels in place to protect the interior from dust.

CLEANING

The 607 Storage Monitor should be cleaned as often as operating conditions require. Accumulation of dirt in the instrument can cause overheating and component breakdown. Dirt on components acts as an insulating blanket and prevents efficient heat dissipation. It also provides an electrical conduction path which may result in instrument failure. The cabinet panels provide protection against dust in the interior of the instrument.

CAUTION

Avoid the use of chemical cleaning agents which might damage the plastics used in this instrument. Use isopropyl alcohol, total denatured ethyl alcohol or TP35. Before using any other solvents, consult your Tektronix Service Center.

Exterior

Loose dust accumulated on the outside of the instrument can be removed with a soft cloth or small brush. The brush is particularly useful for dislodging dirt on and around the front-panel controls. Dirt which remains can be removed with a soft cloth dampened in a mild detergent and water solution. Abrasive cleaners should not be used.

CRT

Clean the crt faceplate protector with a soft, lint-free cloth dampened with denatured alcohol.

Interior

Clean the interior by blowing away the accumulated dust with dry, low-velocity air (approximately 5 lb/in²). Remove any dirt which remains with a soft brush or a cloth dampened with a mild detergent and water solution. A cotton-tipped applicator is useful for cleaning in narrow spaces or for cleaning more delicate circuit components.

CAUTION

Make sure circuit boards and components are dry before applying power to prevent damage from arcing.

The high-voltage circuits should receive special attention. Excessive dirt in this area may cause high-voltage arcing and result in improper instrument operation.

VISUAL INSPECTION

The 607 Storage Monitor should be inspected occasionally for such defects as broken connections, improperly seated semiconductors, damaged or improperly installed circuit boards, and heat-damaged parts. The corrective procedure for most visible defects is obvious; however, particular care must be taken if heat-damaged parts are found. Overheating usually indicates other trouble in the instrument; therefore, it is important that the cause of overheating be corrected to prevent recurrence of the damage.

SEMICONDUCTOR CHECKS

Periodic checks of semiconductors are not recommended. The best check of semiconductor performance is actual operation in the instrument. More details on semiconductors are given under Troubleshooting.

PERIODIC ELECTRICAL ADJUSTMENT

To ensure accurate measurements, check the electrical adjustment of this instrument after each 1000 hours of operation, or every 6 months if used infrequently. In addition, replacement of components may necessitate adjustment of the affected circuits. Complete adjustment instructions are given in section 6, Performance Check and Adjustment.

TROUBLESHOOTING

The following information is provided to facilitate troubleshooting of the 607 Storage Monitor. Information contained in other sections of this manual should be used in conjunction with the following data to aid in locating a defective component. An understanding of the circuit operation is helpful in locating troubles. See section 4, Theory of Operation, for this information.

TROUBLESHOOTING AIDS

Diagrams

Complete schematic diagrams are given on the foldout pages in section 9, Diagrams and Circuit Board Illustrations. The component number and electrical value of each component in this instrument is shown on these diagrams (see the first page of the Diagrams and Circuit Board Illustrations section for definitions of the reference designators and symbols used to identify components in this instrument).

Pertinent voltages and numbered waveform test points are shown on the schematic diagrams. The typical waveforms obtained at the numbered test points are located to the left of the schematic diagram to which they refer. The portions of the circuits mounted on circuit boards are enclosed with heavy solid black lines.

To help locate the major circuits and the components contained in those major circuits, each schematic diagram is divided into functional blocks as indicated by wide shaded lines. These functional blocks are described in detail in section 4, Theory of Operation.

Circuit Board Illustrations

To aid in locating circuit boards, a circuit board location illustration appears on the back of the foldout page facing the schematic diagrams. In addition, illustrations of the circuit boards are included along with the physical location of the components and waveform test points that appear on the schematic diagram. Each circuit board illustration is arranged in a grid with an index for rapid location of components.

Adjustment and Test Point Locations

To aid in locating test points and adjustable components referenced in the Performance Check and Adjustment procedures, an Adjustment and Test Point Locations pullout page is provided in section 9, Diagrams and Circuit Board Illustrations.

Component Color Coding

The instrument contains brown composition resistors, some metal-film resistors and some wire-wound resistors. The resistance values of wire-wound resistors are usually printed on the component body. The resistance values of composition resistors and metal-film resistors are color coded on the components using the EIA color code (some metal-film resistors may have the value printed on the body). The color code is read starting with the stripe nearest the end of the resistor. Composition resistors have four stripes, which consist of two significant figures, a multiplier, and a tolerance value. Metal-film resistors have five stripes consisting of three significant figures, a multiplier, and a tolerance value.

The values of common disc capacitors and small electrolytics are marked on the side of the component body. The white ceramic and epoxy-coated tantalum capacitors used in the instrument are color coded using a modified EIA code.

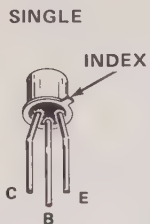
The cathode end of glass-encased diodes is indicated by a stripe, a series of stripes, or a dot. The cathode and anode ends of metal-encased diodes can be identified by the diode symbol marked on the body.

Cam-Switch Contact Identification

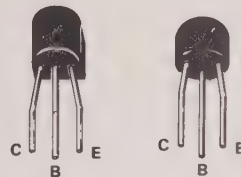
Cam switches shown on the diagrams are drawn to indicate the position of the contact in the complete switch assembly counting from the front, or knob end of the switch, towards the rear. The contact closure chart on the diagrams indicates when each contact is closed.

Semiconductor Lead Configurations

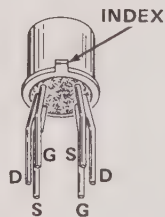
Figure 5-1 shows the lead configurations of the semiconductors.



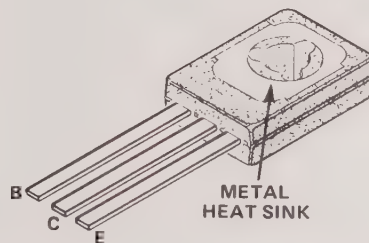
[..... METAL CASE
TRANSISTOR]



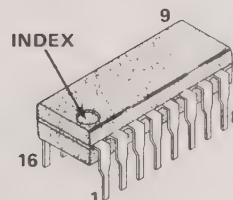
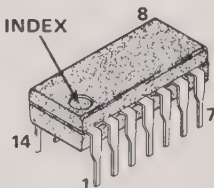
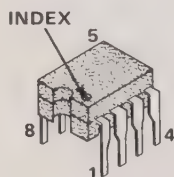
[..... PLASTIC CASE
TRANSISTORS]



[..... DUAL METAL
CASE FET]



[..... POWER
TRANSISTOR]



[..... INTEGRATED CIRCUITS]

2091-14

Figure 5-1. Semiconductor lead configurations.

Multi-Connector Holders

The multi-connector holders are keyed with two triangles, one on the holder and one on the circuit board. When a connection is made perpendicular to a circuit board surface, the orientation of the triangle and slot numbers on the connector holder is determined by the direction of the nomenclature marking (see Fig. 5-2).

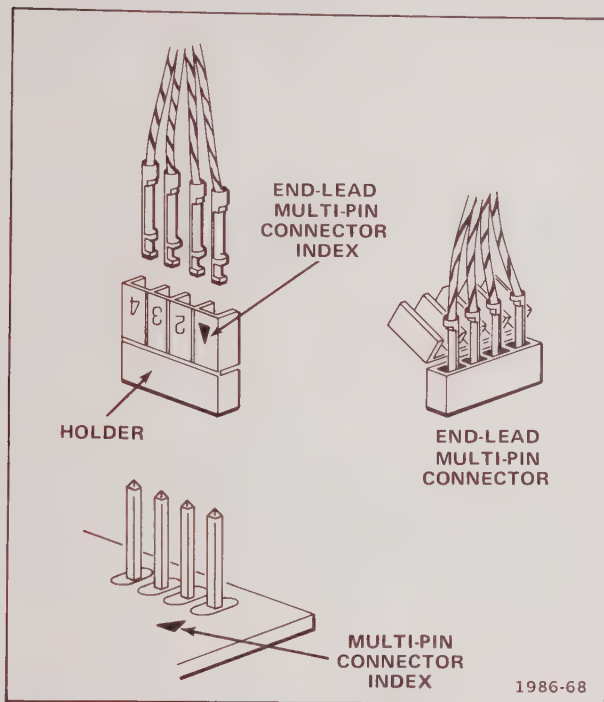


Figure 5-2. Orientation of multi-connector holders.

Troubleshooting Equipment

The following equipment is useful for troubleshooting the 607 Storage Monitor:

Semiconductor Tester

Description: Dynamic-type tester.

Purpose: To test the semiconductors used in this instrument.

Recommended type: TEKTRONIX Type 576 Transistor Curve Tracer or equivalent.

Multimeter

Description: Input impedance, 10 megohms. Voltage range 0 to 300 volts, ac and dc. Resistance range, 0 to 50 megohms. Accuracy, within 3%. Test probes must be insulated to prevent accidental shorting.

Multimeter (Cont.)

Purpose: To check voltages and for general troubleshooting.

Test Oscilloscope

Description: Frequency response, dc to at least 2 megahertz (to 10 megahertz for troubleshooting the Z-Axis Amplifier). Deflection factor, 1 millivolt/division to 5 volts/division. A 10X, 10-megohm voltage probe should be used to reduce circuit loading for voltage measurements.

Purpose: To check operating waveforms.

TROUBLESHOOTING TECHNIQUES

This troubleshooting procedure is arranged in an order that checks the simple trouble possibilities before proceeding with extensive troubleshooting. The first few checks ensure proper connection, operation, and adjustment. If the trouble is not located by these checks, the remaining steps aid in locating the defective component. When the defective component is located, it should be replaced by performing the procedure given under Component Replacement in this section.

1. Check Control Settings

Incorrect control settings can imitate a trouble that does not exist. If there is any question about the correct function or operation of any control, refer to section 2, Operating Instructions.

2. Check Associated Equipment

Before proceeding with troubleshooting, check that the equipment used with this instrument is operating correctly. Also, check that the input signals are properly connected and that the interconnecting cables are not defective. Check the line-voltage source.

3. Visual Check

Visually check that portion of the instrument in which the trouble is located. Many troubles can be found by visible indications, such as unsoldered connections, broken wires, damaged circuit boards and damaged components.

4. Check Instrument Adjustment

Check the electrical adjustment of this instrument, or of the affected circuit if the trouble appears in one circuit. The apparent trouble may only be a result of misadjustment. Complete adjustment instructions are given in section 6, Performance Check and Adjustment.

TABLE 5-1
Power Supply Output Voltage

Power Supply	Test Point	Output Voltage Range	Typical Ripple (Peak-to-Peak)
+5 V	TP +5 V	+4.75 V to +5.25 V	5 mV or less
+15 V (Adjustable)	TP +15 V	+14.92 V to +15.08 V	5 mV or less
−30 V	TP −30 V	−29.10 V to −30.90 V	5 mV or less
+80 V	TP +80 V	+75 V to +90 V	0.5 V or less
+170 V	TP +170 V	+160 V to +190 V	1 V or less
−1500 V (Adjustable)	Pin 2 of crt socket	−1470 V to −1530 V	

5. Isolate Trouble to a Circuit

To isolate trouble to a particular circuit, note the trouble symptom. The symptom often identifies the circuit in which the trouble is located. When trouble symptoms appear in more than one circuit, check the affected circuits by taking voltage and waveform readings.

Incorrect operation of all circuits often indicates trouble in the power supplies. Check first for the correct output voltage of the individual supplies. A defective component elsewhere in the instrument can appear as a power supply trouble and may also affect the operation of other circuits. Table 5-1 lists the output voltage range and typical ripple of the power supplies in the 607. These voltages are measured between the power-supply test points and ground (see Adjustment and Test Point Locations pullout page in section 9, Diagrams and Circuit Board Illustrations, for test point locations). If the power-supply voltage and ripple is within the listed range, the supply can be assumed to be working correctly. If outside the range, the supply may be misadjusted or operating incorrectly. Use the procedure given in section 6, Performance Check and Adjustment, to adjust the power supplies.

The Troubleshooting Chart pullout page in section 9, Diagrams and Circuit Board Illustrations, provides a guide for locating a defective circuit. Start at the top left of the Troubleshooting Chart and perform the checks given across the top of the chart until the indicated results are not found. Then proceed to further checks, or the circuit in which the trouble is suspected, as listed underneath the step. The shaded blocks on the Troubleshooting Chart indicate circuit(s) that may cause a malfunction. The circuit(s) listed in shaded blocks are discussed in detail in section 4, Theory of Operation. After the defective circuit has been located, proceed with steps 6 and 7 to locate the defective component(s).

6. Check Voltages and Waveforms

Often the defective component can be located by checking for the correct voltages and waveforms in the circuit. Typical voltages and waveforms are given in section 9, Diagrams and Circuit Board Illustrations.

NOTE

Voltages and waveforms given in section 9, Diagrams and Circuit Board Illustrations, are not absolute and may vary slightly between different 607 Storage Monitors. To obtain operating conditions similar to those used to take these readings, see the appropriate schematic diagram.

7. Check Individual Components

The following procedures describe methods of checking individual components. Components which are soldered in place are best checked by first disconnecting one end. This isolates the measurement from the effects of surrounding circuitry.

WARNING

Disconnect the monitor from the power source before removing or replacing components to avoid electric shock.

TRANSISTORS. A good check of transistor operation is actual performance under operating conditions. A transistor can most effectively be checked by substituting a new component for it (or one which has been checked previously). However, be sure that circuit conditions are not such that a replacement transistor might also be damaged. If substitute transistors are not available, use a dynamic tester. Static-type testers are not recommended, since they do not check operation under simulated operating conditions.

INTEGRATED CIRCUITS. Integrated circuits (IC's) can be checked with a voltmeter, test oscilloscope, or by direct substitution. A good understanding of the circuit operation is essential to troubleshooting circuits using IC's. In addition, operating waveforms, logic levels, and other operating information for the IC's are given in the section 4, Theory of Operation. Be careful when checking voltages and waveforms around the integrated circuits so that adjacent leads

are not shorted together. A convenient means of clipping a test probe to in-line multi-pin integrated circuits is with an integrated-circuit test clip. This device also doubles as an integrated-circuit extraction tool.

DIODES. A diode can be checked for an open or shorted condition by measuring the resistance between terminals with an ohmmeter scale having a low internal source current, such as the R X 1K scale. The resistance should be very high in one direction and very low when the meter leads are reversed.

RESISTORS. Check the resistors with an ohmmeter. Resistor tolerance is given in section 7, Replaceable Electrical Parts. Normally, resistors do not need to be replaced unless the measured value varies widely from the specified value.

INDUCTORS. Check for open inductors by checking continuity with an ohmmeter. Shorted or partially shorted inductors can usually be found by checking the waveform response when high-frequency signals are passed through the circuit. Partial shorting often reduces high-frequency response.

CAPACITORS. A leaky or shorted capacitor can best be detected by checking resistance with an ohmmeter on the highest scale. Do not exceed the voltage rating of the capacitor. The resistance reading should be high after initial charge of the capacitor. An open capacitor can best be detected with a capacitance meter or by checking if the capacitor passes ac signals.

8. Repair and Readjust the Circuit

If any defective parts are located, follow the replacement procedures given under Component Replacement in this section. Check the performance of any circuit that has been repaired or that has had any electrical components replaced. Readjustment of the circuit may be necessary.

CORRECTIVE MAINTENANCE

Corrective maintenance consists of component replacement and instrument repair. Special techniques required to replace components in this instrument are given here.

OBTAINING REPLACEMENT PARTS

Standard Parts

All electrical and mechanical part replacements can be obtained through your local Tektronix Field Office or representative. However, many of the standard electronic components can be obtained locally in less time than is required to order them from Tektronix, Inc. Before ordering or purchasing replacement parts, check the parts list for value, tolerance, rating, and description.

NOTE

When selecting replacement parts, remember that the physical size and shape of a component may affect its performance in the instrument. All replacement parts should be direct replacements unless it is known that a different component will not adversely affect instrument performance.

Special Parts

Some components in this instrument are manufactured or selected by Tektronix, Inc., to meet specific performance requirements, or are manufactured for Tektronix, Inc. in accordance with our specifications. Most of the mechanical parts used in this instrument have been manufactured by Tektronix, Inc. Order all special parts directly from your local Tektronix Field Office or representative.

Ordering Parts

When ordering replacement parts from Tektronix, Inc., include the following information:

1. Instrument type.
2. Instrument serial number.
3. A description of the part (if electrical, include the circuit number).
4. Tektronix part number.

SOLDERING TECHNIQUES

WARNING

Disconnect the monitor from the power source before soldering to avoid electric shock.

The reliability and accuracy of this instrument can be maintained only if proper soldering techniques are used when repairing or replacing parts. General soldering techniques which apply to maintenance of any precision electronic equipment should be used when working on this instrument. Use only 60/40 rosin-core, electronic-grade solder. The choice of soldering iron is determined by the repair to be made. When soldering on circuit boards or small wiring, use only a 15-watt, pencil-type, soldering iron. A higher wattage-rating soldering iron can cause the etched circuit wiring to separate from the board base material and melt the insulation from small wiring. Always keep the soldering iron tip properly tinned to ensure the best heat transfer to the solder joint. Apply only enough heat to remove the component or to make a good solder joint. To protect heat-sensitive components, hold the component lead with a pair of long-nose pliers between the component body and the solder joint. Use a solder-removing wick to remove excess solder from connections or to clean circuit board pads.

The following technique should be used to replace components on any of the circuit boards. Most components can be replaced without removing the boards from the instrument.

1. Touch the soldering iron to the lead at the solder connection. Never place the iron directly on the board, as this may damage the board.
2. Melt a small amount of solder onto the component lead connection. This replaces the flux, which may have been removed during cleaning, and facilitates removal of the component.
3. Grip the component lead with a pair of long-nose pliers. When the solder begins to flow, gently pull the component lead from the board.

NOTE

Some components are difficult to remove from the circuit board due to a bend placed in each lead during machine insertion of the component. The purpose of the bent leads is to hold the component in position during a flow-soldering manufacturing process which solders all components at once. To make removal of machine inserted components easier, straighten the leads of the component on the back of the circuit board using a small screwdriver or pliers while heating the soldered connection.

4. Bend the leads of the replacement component to fit the holes in the circuit board. If the component is replaced while the board is mounted in the instrument, cut the leads so they will just protrude through the board. Insert the leads into the holes in the board so that the component is firmly seated against the board, or as originally positioned.
5. Touch the iron to the connection and apply enough solder to make a firm solder joint.
6. Cut off any excess lead protruding through the board (if not clipped in step 4).
7. Clean the area around the solder connection with a flux-removing solvent. Be careful not to remove information printed on the circuit board.

COMPONENT REMOVAL AND REPLACEMENT

WARNING

Disconnect the monitor from the power source before replacing components to avoid electric shock.

The exploded-view drawings associated with the Replaceable Mechanical Parts list in section 10 may be helpful in the removal or disassembly of individual components or sub-assemblies.

Circuit Boards

If a circuit board is damaged beyond repair, the entire assembly, including all soldered-on components, can be replaced. Part numbers are given in section 7, Replaceable Electrical Parts, for the completely wired boards.

All the boards in this instrument are mounted on the chassis. Removal and replacement procedures for the Z-Axis Amplifier, and High- and Low-Voltage Power Supply boards are included here. The remaining boards are easily removed and replaced by first removing the securing screws and then the interconnecting wires. Replacement is accomplished in the reverse order of removal.

Z-AXIS AMPLIFIER BOARD—A2. Remove and replace the Z-Axis Amplifier board as follows (see Fig. 5-3):

1. Remove the 2 securing screws to loosen the Z-Axis Amplifier board.

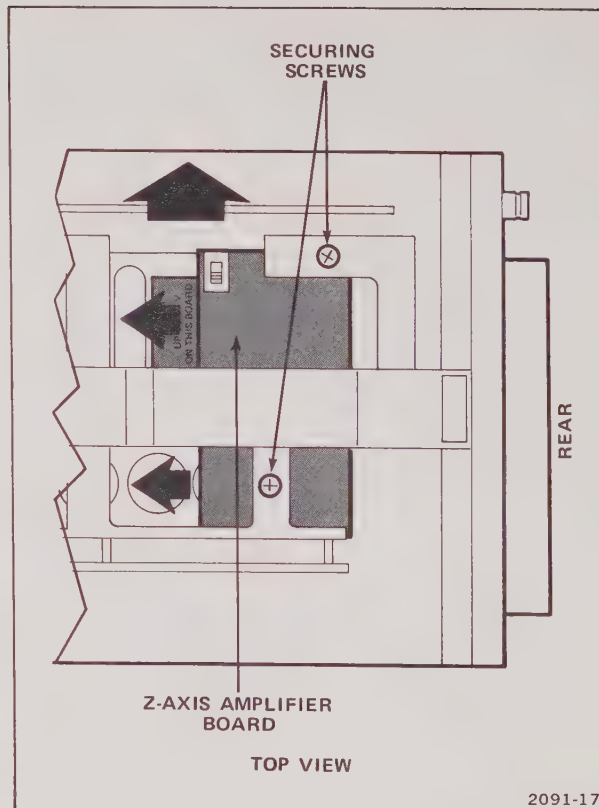


Figure 5-3. A2—Z-Axis Amplifier board removal and replacement.

2. Slide the board sideways toward the front of the instrument.
3. Unsolder the attaching wires from the left and top edge of the board (see Soldering Techniques in this section).
4. Lift the top of the board up through the slot in the chassis assembly and slide the board out of the instrument.
5. Unsolder the remaining wires to free the board.
6. Replace the Z-Axis Amplifier board in the reverse order of removal.

HIGH-VOLTAGE POWER SUPPLY BOARD—A3. Remove and replace the High-Voltage Power Supply board as follows (see Fig. 5-4):

1. Disconnect the crt anode lead at the anode plug.

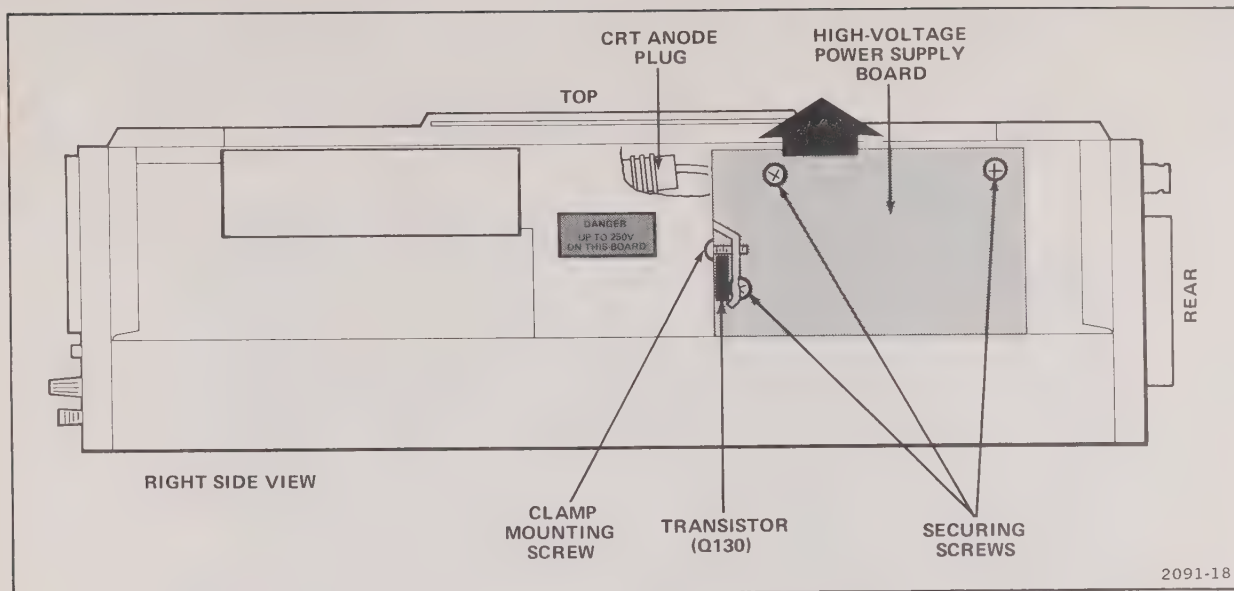


Figure 5-4. A3—High-Voltage Power Supply board removal and replacement.

WARNING

Momentarily ground the jack (crt) end of the anode plug to the chassis to dissipate any stored charge.

2. Remove the chassis-mounted clamp (on the left side of the board) that holds transistor Q130 against the heat sink.
3. Remove the 3 securing screws that hold the board to the chassis.
4. Gently lift the board up and over the chassis rail.
5. Unsolder all attached wires to free the board (see Soldering Techniques in this section).
6. Replace the High-Voltage Power Supply board in the reverse order of removal. Refer to Semiconductors in this section for instructions on replacing the transistor (Q130) heat sink.

LOW-VOLTAGE POWER SUPPLY BOARD—A5. Remove and replace the Low-Voltage Power Supply board as follows (see Fig. 5-5):

1. Reach around behind the power transistors (Q30, Q60, and Q70) and release the clips that hold the transistor cases to the heat sinks.

2. Unsolder the wires from the board (see Soldering Techniques in this section).

3. Remove the 2 securing screws to free the board from the instrument.

4. Replace the Low-Voltage Power Supply board in the reverse order of removal. Refer to Semiconductors for instructions on replacing the transistor (Q30, Q60, and Q70) heat sinks.

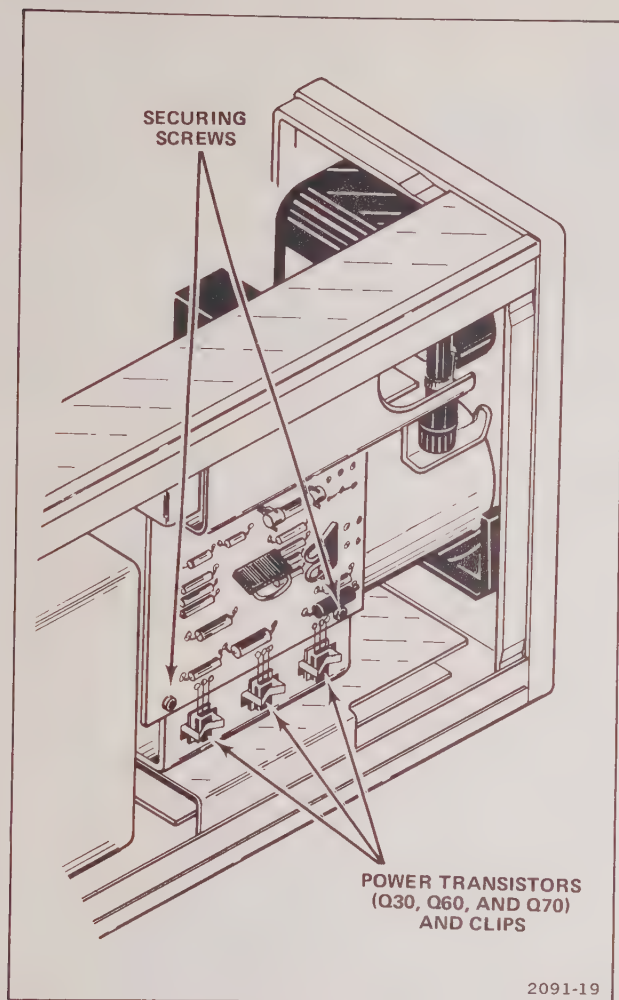
Semiconductors

Semiconductors should not be replaced unless actually defective. If removed from their sockets during routine maintenance, return them to their original sockets. Unnecessary replacement of semiconductors may affect the adjustment of the instrument. When semiconductors are replaced, check the operation of circuits which may be affected.

CAUTION

The POWER switch must be turned off before removing or replacing semiconductors to prevent damage to the instrument.

Replacement semiconductors should be of the original type or a direct replacement. Lead configurations of the semiconductors used in this instrument are shown in Figure 5-1.



2091-19

Figure 5-5. A5—Low-Voltage Power Supply board removal and replacement.

Some plastic case transistors have lead configurations which do not agree with those shown. If a replacement transistor is made by a different manufacturer than the original, check the manufacturer's basing diagram for correct basing. All transistor sockets are wired for the standard basing as used for metal-cased transistors. When removing soldered-in transistors, use a solder-removing wick to remove the solder from the holes in the circuit board. Transistors which have heat radiators or are mounted on the chassis use silicone grease to increase heat transfer. Replace the silicone grease on both sides of the insulator plate and on the metal tab, if the transistor has one, when replacing these transistors.

WARNING

Handle silicone grease with care. Avoid getting silicone grease in the eyes. Wash hands thoroughly after use.

To replace one of the power transistors mounted on the chassis adjacent to the Low-Voltage Power Supply board, first unsolder the leads. Then, remove the push-on clip that clamps the transistor to the chassis. Remove the defective transistor.

To replace the transistor mounted on the chassis adjacent to the High-Voltage Power Supply board, first unsolder the leads. Then remove the chassis clamp to remove the defective transistor.

An extracting tool should be used to remove the 8-pin integrated circuits to prevent damage to the pins. This tool is available from Tektronix, Inc.; order Tektronix Part 003-0619-00. If an extracting tool is not available, use care to avoid damaging the pins. Pull slowly and evenly on both ends of the IC. Try to avoid having one end disengage from the socket before the other.

Cathode-Ray Tube Removal

Remove the cathode-ray tube (crt) as follows (see Fig. 5-6):

WARNING

Use care when handling a crt. Breakage of the crt causes a high velocity scattering of glass fragments (implosion). Protective clothing and safety glasses should be worn. Avoid striking the crt on any object which might cause it to crack or implode. When storing a crt, place it in a protective carton or set it face down in a protected location on a smooth surface with a soft mat under the faceplate.

1. Remove the bezel assembly and snap-in implosion shield with graticule by removing the 2 bezel securing screws on the front of the instrument.
2. Remove the left and right cabinet panels (see Cabinet Panel Removal in this section).
3. Disconnect the 4 leads from the crt X and Y deflection plate pins.

NOTE

The red and black leads entering the crt shield from the Deflection Amplifier board and the rear-panel TRACE ROTATION control are connected to the display-rotation coil inside the shield. They will not hamper crt removal and need not be unsoldered.

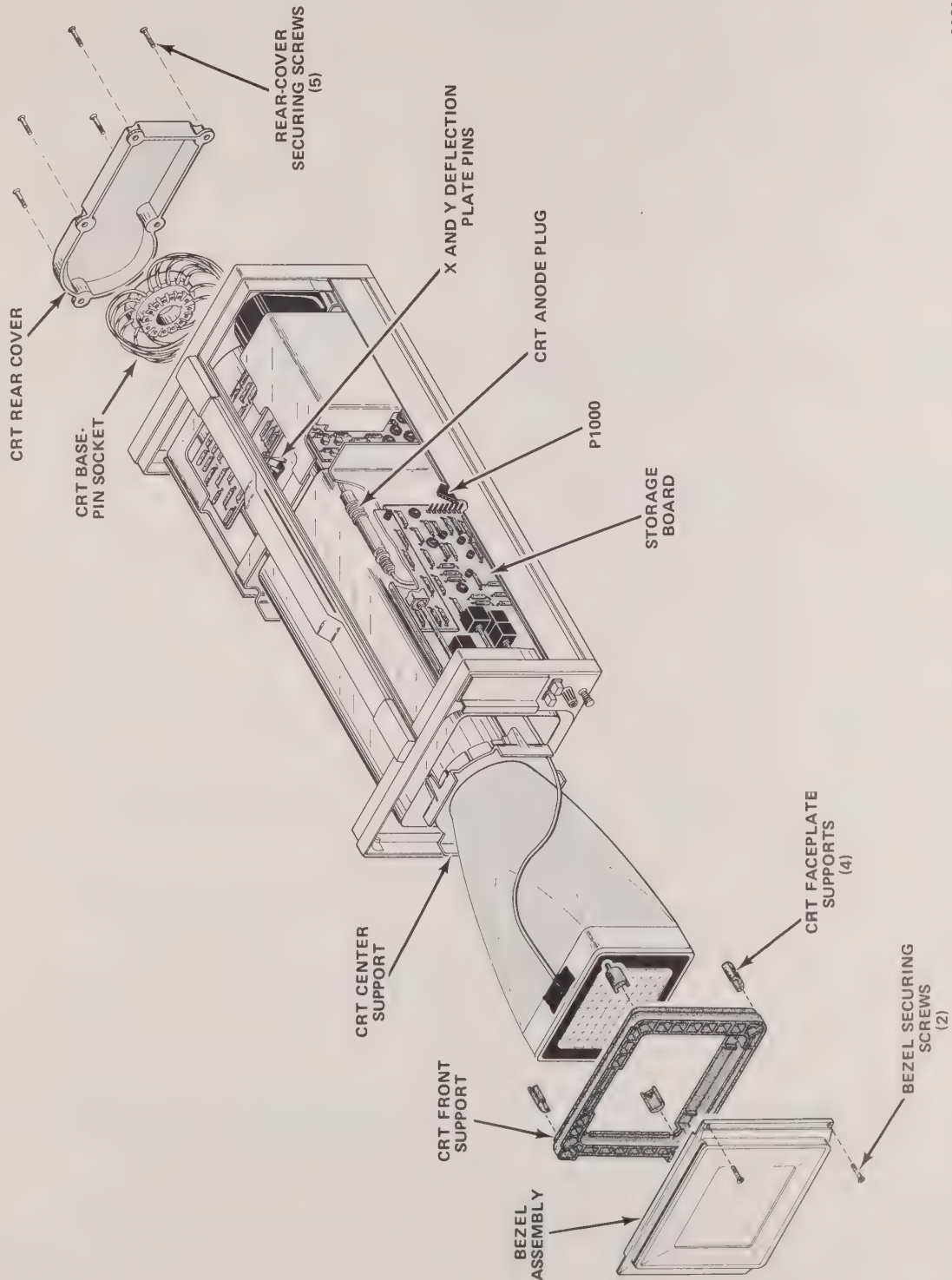


Figure 5-6. Cathode ray tube (crt) removal and replacement.

4. Disconnect plug P1000 from the Storage board and the anode lead from the crt anode plug.
5. Remove the 5 crt rear-cover securing screws and remove the cover.
6. Remove the crt base-pin socket.
7. With one hand on the front of the instrument, gently push on the crt base to slide the crt forward. The crt front support will slide out with the crt.
8. Remove the crt front support and gently pull the crt out from the front of the instrument while guiding plug P1000 and the crt anode plug through the holes in the crt shield.

NOTE

Be careful not to loose the soft plastic crt faceplate supports if they should become detached during crt removal.

9. Slide the crt center support toward the rear of the crt to remove it.

Cathode-Ray Tube Replacement

Replace the cathode-ray tube (crt) as follows (see Fig. 5-6):

1. Slide the crt center support to the bottom of the shield with the 4 legs facing the back of the instrument.
2. Press the crt front support into the front-panel recess.
3. Insert the 4 soft plastic crt faceplate supports into the corners of the crt front support.
4. Insert the neck of the crt part way into the shield.
5. Feed plug P1000 and the crt anode plug through the appropriate holes in the shield.
6. Fully insert the crt through the crt center support and into the shield. Make sure the 4 soft plastic crt faceplate supports are properly positioned in the corners of the crt front support.
7. Connect plug P1000 to the Storage board and the crt anode plug to the mating jack.

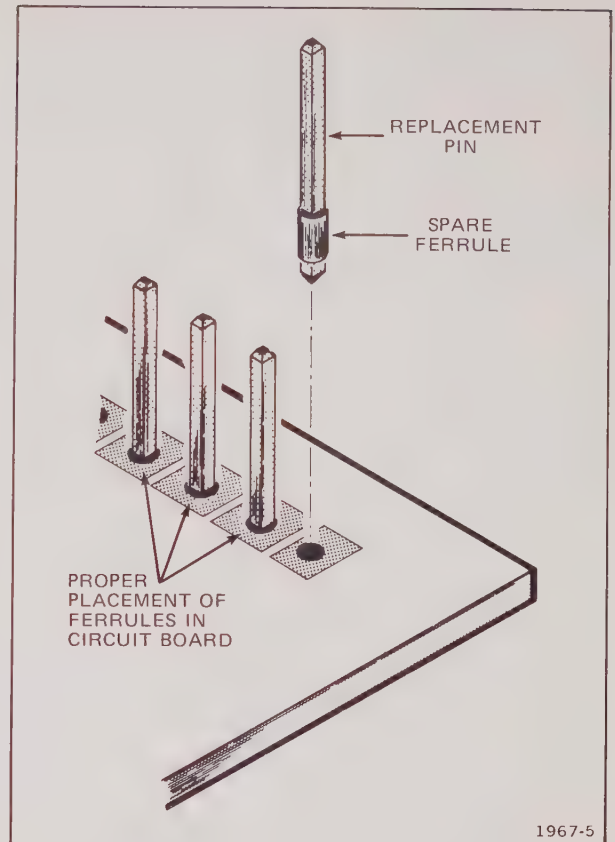


Figure 5-7. Exploded view of circuit board pin and ferrule.

8. Mount and fasten the bezel and implosion shield to the front panel with the 2 bezel securing screws.
9. Place the crt base-pin socket onto the crt base pins and replace the crt rear cover.
10. Connect the 4 leads to the proper crt X and Y deflection pins.

NOTE

The replacement crt will require that the monitor be readjusted. Refer to section 6, Performance Check and Adjustment.

Power Transformer Replacement

Replace the power transformer only with a direct replacement Tektronix transformer. After the transformer has been replaced, check the power supply output voltages and the instrument performance as outlined in section 6, Performance Check and Adjustment.

Interconnecting Circuit-Board Pins

A circuit-board pin replacement kit, including necessary tools, instructions, and replacement pins with attached spare ferrules, is available from Tektronix, Inc. Order Tektronix Part 040-0542-00.

To replace a damaged pin on a circuit board, first disconnect any pin connectors. Then unsolder (see Soldering Techniques) the damaged pin and pull it from the board with a pair of pliers, leaving the ferrule (see Fig. 5-7) in the

hole if possible. If the ferrule remains in the circuit board, remove the spare ferrule from the replacement pin and press the new pin into the hole in the circuit board. If the ferrule is removed with the damaged pin, clean out the hole using a solder-removing wick and a scribe. Then press the replacement pin, with attached spare ferrule, into the hole. Position the replacement pin in the same manner as the original pin. Solder the pin to the circuit board on each side of the board. If the original pin was bent at an angle to mate with a connector, carefully bend the new pin to the same angle. Replace the pin connector.

PERFORMANCE CHECK AND ADJUSTMENT

This section contains information necessary to perform a complete instrument performance check and adjustment. Limits given in the procedure are adjustment guides and should not be interpreted as performance requirements unless preceded by a check mark (✓). Where possible, instrument performance is checked before an adjustment is made.

PRELIMINARY INFORMATION

Adjustment Interval

To maintain accuracy, check the performance of the 607 every 1000 hours of operation, or every 6 months if used infrequently. Before complete adjustment, thoroughly clean and inspect this instrument as outlined in section 5, Maintenance.

Tektronix Field Service

Tektronix Field Service Centers and the Factory Service Center provide instrument repair and adjustment services. Contact your Tektronix Field Office or representative for further information.

Using This Procedure

This Performance Check and Adjustment procedure can be used either for complete adjustment or as a check of instrument performance. Completion of each step in the procedure ensures that the instrument is correctly adjusted and operating within specified limits. Refer to the following discussion for instructions on a complete or partial check and adjustment.

INDEX. An index precedes the procedure to aid in locating Performance Check and Adjustment steps.

PERFORMANCE CHECK. Instrument performance can be checked by performing the complete Performance Check and Adjustment procedure and omitting only the ADJUST parts of the steps. A check mark (✓) preceding a CHECK indicates that the limit given is a performance requirement specified under Specification in section 1, General Information.

ADJUSTMENT. Completion of each step in the Performance Check and Adjustment procedure ensures that the instrument is correctly adjusted and performing within specified limits. Where possible, instrument performance is checked before an adjustment is made. For best overall performance when performing the complete adjustment procedure, make each adjustment to the exact setting indicated.

PARTIAL PROCEDURES. The following procedure is written to completely check and adjust the instrument to the Specification in section 1, General Information. If the applications for which the instrument is used do not require the full available performance, the procedure and the required equipment list can be shortened accordingly.

A partial performance check and adjustment may be desirable after replacing components, or to touch up the adjustment of a portion of the instrument. To check or adjust only part of the instrument, refer to the Equipment Required list which precedes that portion of the procedure to be performed. To avoid unnecessary adjustment of other parts, adjust only if the tolerance given in each CHECK step is not met.

TEST EQUIPMENT REQUIRED

The test equipment listed in Table 6-1 is required for a complete performance check and adjustment of this instrument. The specifications given in Table 6-1 for test equipment are the minimum required to meet the Specifications in section 1. Detailed operating instructions for test equipment are omitted in this procedure. Refer to the test equipment instruction manual if more information is needed.

Test Equipment Alternatives

The test equipment listed in the Examples of Applicable Test Equipment column, Table 6-1, is required to check and adjust this instrument. The Performance Check and Adjustment procedure is based on the first item of equipment given as an example. If other equipment is substituted, control settings or setups may need to be altered. If the exact item of equipment given as an example is not available, refer to the Minimum Specifications column to determine if other equipment may be substituted. Then check the Purpose column. If you determine that your measurement requirements will not be affected, the item and corresponding step(s) can be deleted.

TABLE 6-1
Test Equipment

Description	Minimum Specifications	Purpose	Examples of Applicable Test Equipment
Test Oscilloscope	Bandwidth, dc to at least 8 MHz; deflection factor, 0.2 to 5 V/div within 2%, sweep rate, 0.5 ms to 20 μ s/div.	Adjust storage levels, and pulse height, vertical, horizontal and Z-axis gain and compensation. Check phase difference, horizontal, vertical and Z-axis bandwidth.	TEKTRONIX 5403/D40 Oscilloscope with 5A48 Dual Trace Amplifier and 5B42 Delaying Time Base plug-ins.
Ramp Generators (2)	Ramp duration, 10 μ s to 5 ms within 3%; ramp amplitude, +1 to +3 V into 50 Ω . Gate output amplitude, at least 0.3 V open circuit.	Adjust trace rotation, Y-axis alignment, geometry; vertical, horizontal and Z-axis gain and compensation. Check dot writing time, stored linear writing speed, horizontal, vertical, and Z-axis bandwidth.	TEKTRONIX RG 501 Ramp Generators (operate in TM 500-series power module).
Square-Wave Generator	Frequency, 1 kHz, 10 kHz, and 100 kHz; risetime, 50 ns or less; amplitude, 5 V into 50 Ω .	Adjust vertical, horizontal, and Z-axis gain and compensation.	TEKTRONIX PG 506 Calibration Generator (operates in TM 500-series power module).
Sine-Wave Generator	Frequency, 350 kHz to at least 5 MHz; reference frequency, 50 kHz; amplitude, 0.5 to 5 V within 3% into 50 Ω .	Check horizontal, vertical, and Z-axis bandwidth; horizontal and vertical phase difference, and Option 4 sweep generator trigger slope/level.	TEKTRONIX SG 503 Leveled Sine-Wave Generator (operates in TM 500-series power module).
Time-Mark Generator (Required for Option 4 only)	Marker output, 1 μ s to 0.1 s; accuracy, within 1%.	Check Option 4 sweep timing.	TEKTRONIX TG 501 Time-Mark Generator (operates in TM 500-series power module).
Pulse Generator	Negative-going pulse. Pulse period, 1 ms; pulse duration, 0.5 and 1 μ s; accuracy, within 5%; amplitude, 0.5 to at least 5 V into 50 Ω ; rise time, 50 ns or less.	Check dot writing time.	TEKTRONIX PG 501 Pulse Generator (operates in TM 500-series power module).
Precision DC Voltmeter	Measurement range, -30 to +180 V; measurement accuracy, within 0.1%.	Adjust +15 V supply and crt bias. Check low-voltage supplies.	TEKTRONIX DM 502 Digital Multi-Meter (operates in TM 500-series power module).
DC Voltmeter	Measurement range, -1470 to -1530 V; measurement accuracy, within 3%.	Adjust -1500 V supply.	Triplett Model 630 NA.
10X Probe	Compatible with test oscilloscope used.	Adjust Z-axis gain, compensation and bandwidth, storage levels and pulse height.	TEKTRONIX P6065A 10X Probe.
5X Attenuator	Impedance, 50 Ω within 2%; connectors, BNC.	Adjust horizontal, vertical, and Z-axis gain and compensation. Check dot writing time.	Tektronix part 011-0060-01.
50-Ohm Termination	Impedance, 50 Ω within 2%; connectors, BNC.	Adjust Option 4 sweep timing. Check dot writing time.	Tektronix part 011-0049-01.

TABLE 6-1 (CONT.)
Test Equipment

Description	Minimum Specifications	Purpose	Examples of Applicable Test Equipment
BNC T Connector		Adjust horizontal, vertical, and Z-axis gain and compensation; horizontal and vertical phase difference.	Tektronix part 103-0030-00.
50-Ohm BNC Cables (4)	Impedance, 50 Ω ; length, 42 inches, connectors, BNC.	Provide signal interconnections.	Tektronix part 012-0057-01.
Screwdriver	3-inch shaft, 3/32-inch bit.	Perform internal adjustments.	Xcelite R-3323.

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PRELIMINARY PROCEDURE

NOTE

The performance of this instrument can be checked at any ambient temperature from 0° to +50° C unless otherwise stated. Adjustments must be performed at an ambient temperature from +20° to +30° C for specified accuracies.

1. Check that the internal Line Voltage Selector has been set for the correct input line voltage (see section 3, Installation).
2. Check that the crt has an 8 X 10 division scribed graticule (standard accessory) over the display area.
3. Remove the cabinet panels (see section 5, Maintenance) to gain access to the internal controls and test points.
4. Connect the instrument to the line-voltage source.
5. Apply power and allow at least 20 minutes warm-up time.
6. Set the controls as follows.

NOTE

Refer to the Internal Control and Selector Locations pullout page in section 9, Diagrams and Circuit Board Locations, for the locations of the internal switches.

INTERNAL

Int Swp (Option 4 only) X-Y (down position)
Int Blank (Option 4 only) X-Y (right position)

WARNING

The black finned transistor heat sinks on the Horizontal (X) Amplifier are elevated to a maximum of +80 volts. To avoid electric shock, always turn the instrument power off before changing the settings of the X Atten switches.

X and Y Atten
(all) 1X (up position)

FRONT PANEL

PERSISTENCE/
SAVE TIME Fully counterclockwise (detent) and knob pushed in
STORE Non-store (button out)
INTENSITY Fully counterclockwise
FOCUS Midrange
Horizontal and
Vertical Position . . . Midrange
POWER On (button out)

A. POWER SUPPLIES

Equipment Required

1. Precision dc voltmeter (low-voltage supply)
2. Dc voltmeter (high-voltage supply)

BEFORE YOU BEGIN, see

TEST POINT AND
ADJUSTMENT LOCATIONS

in the Diagrams and Circuit Board Illustrations section.

NOTE

Perform the Preliminary Procedure before making the following checks and adjustments.

A1. CHECK POWER SUPPLY OUTPUT VOLTAGE

- a. Connect the precision dc voltmeter between the appropriate voltage test points and ground.
- b. CHECK—Voltmeter for the output voltage range listed in Table 6-2:

TABLE 6-2
Power Supply Output Voltage

Supply	Test Point	Output Voltage Range
+5 V	TP +5 V	+4.75 V to +5.25 V
+15 V	TP +15 V	+14.92 V to +15.08 V (Adjusted for +15.000 V in step A2)
−30 V	TP −30 V	−29.10 V to −30.90 V
+80 V	TP +80 V	+75 V to +90 V
+170 V	TP +170 V	+160 V to +190 V
−1500 V	Pin 2 of crt socket	−1470 V to −1530 V (Adjusted for −1500 V in step A3)

A2. ADJUST +15-VOLT SUPPLY (R40)

- a. Connect the precision dc voltmeter between test point TP +15 V and ground.

- b. ADJUST—R40 (+15 V) for a voltmeter reading of exactly +15.000 volts.

- c. INTERACTION—Any change in the +15-volt supply beyond the limits in Table 6-2 may affect the operation of all circuits in the instrument.

A3. ADJUST −1500-VOLT SUPPLY (R100)

WARNING

Turn off instrument power when connecting and disconnecting the dc voltmeter. Potentially dangerous electrical shock hazards exist at several points on the High-Voltage Power Supply board and the crt socket.

- a. Connect the dc voltmeter (set for at least −1500 volts full scale) between pin 2 of the crt socket and ground. (Remove protective cap over crt socket.)
- b. CHECK—Voltmeter for reading from −1470 volts to −1530 volts.
- c. ADJUST—R100 (HV) for exactly −1500 volts.
- d. Turn off the instrument power and disconnect the voltmeter. (Replace protective cap over crt socket.)

B. CRT CIRCUIT

Equipment Required

1. Precision dc voltmeter
2. Ramp generator
3. 50-ohm cables (2)

BEFORE YOU BEGIN, see

TEST POINT AND
ADJUSTMENT LOCATIONS

in the Diagrams and Circuit Board Illustrations section.

NOTE

Perform the Preliminary Procedure before making the following checks and adjustments.

CAUTION

Do not allow a high-intensity spot to remain stationary on the crt. The crt phosphor could be permanently damaged.

NOTE

For critical applications, slight readjustment of R170, Astig, may improve dot definition.

B1. ADJUST CRT BIAS (R192)

- a. Set the Position and INTENSITY controls for a visible dot on the crt.
- b. Connect the precision dc voltmeter between test point TP 720 (Z-Axis Amplifier board) and ground.
- c. Set the INTENSITY control for a voltmeter reading of +10 volts. Disconnect the voltmeter.
- d. ADJUST—R192 (Cutoff) until the displayed dot just disappears.
- e. Set the INTENSITY control for a visible dot.

B2. ADJUST ASTIGMATISM (R170)

- a. Set FOCUS control fully clockwise.
- b. ADJUST—R170 (Astig) for a round dot.
- c. Set the FOCUS control for optimum dot definition.

B3. ADJUST TRACE ROTATION (R145)

- a. Apply a 1-volt positive-going, 5 millisecond duration ramp signal from the ramp generator to the + X INPUT connector.
- b. Set the ramp generator amplitude for a 10-division horizontal trace on the crt.
- c. Position the trace to the graticule horizontal center line.
- d. ADJUST—R145 (TRACE ROTATION) to align the trace with the graticule horizontal center line.

✓ **B4. ADJUST Y-AXIS ALIGNMENT (R173)**

- a. Disconnect the ramp generator from the + X INPUT connector and connect it to the + Y INPUT connector.
- b. Set the ramp generator amplitude for an 8-division vertical trace on the crt.
- c. Position the trace to the graticule vertical center line.
- d. ADJUST—R173 (Y-Axis Align) to align the trace with the graticule vertical center line.

✓ **B5. ADJUST GEOMETRY (R165)**

- a. Position the trace to the left edge of the graticule, then to the right edge.

✓Performance Requirement check; see introductory information.

✓ b. CHECK—Trace for 0.1 division or less of bowing at the left and right edge of the graticule.

c. ADJUST—R165 (Geom) for minimum trace bowing at the left and right edge of the graticule.

d. Disconnect the ramp generator from the + Y INPUT connector and connect it to the + X INPUT connector.

e. Position the trace to the top of the graticule, then to the bottom.

✓ f. CHECK—Trace for 0.1 division or less of bowing at the top and bottom of the graticule.

g. If necessary, readjust R165 (Geom) for minimum trace bowing at the top and bottom of the graticule. Then reconnect the ramp generator to the + Y INPUT connector and repeat this procedure until optimum geometry is achieved.

h. Disconnect the ramp generator.

✓Performance Requirement check; see introductory information.

C. VERTICAL (Y) AND HORIZONTAL (X) AMPLIFIERS

Equipment Required

- | | |
|--------------------------|---|
| 1. Test oscilloscope | 5. 50-ohm cables (2) |
| 2. Ramp generator | 6. BNC T connector |
| 3. Square-wave generator | 7. 5X attenuator (optional, depending on test equipment used) |
| 4. Sine-wave generator | |

BEFORE YOU BEGIN, see **TEST POINT AND ADJUSTMENT LOCATIONS**

in the **Diagrams and Circuit Board Illustrations** section.

NOTE

Perform the Preliminary Procedure before making the following checks and adjustments.

✓ **C1. ADJUST VERTICAL (Y) AXIS GAIN AND COMPENSATION (R415, C400, AND C500)**

NOTE

The Y gain is normally set to provide full-screen deflection, depending upon the input signal amplitude. The following procedure adjusts the Y gain so that 1 volt provides 8 divisions of deflection. If the gain adjustment is changed, the + and – attenuator compensation should be readjusted to optimize square-wave response.

WARNING

The black finned transistor heat sinks on the Horizontal (X) Amplifier are elevated to a maximum of +80 volts. To avoid electric shock, always turn the instrument power OFF before changing the settings of the X Atten switches.

- Check that S200 (+ X Atten), S300 (– X Atten), S400 (+ Y Atten), and S500 (– Y Atten) are in the 1X (up) position.
- Apply a positive-going, 5 millisecond ramp at approximately 2 volts amplitude from the ramp generator to the rear-panel + X INPUT connector.
- Connect the square-wave generator through a T connector to the rear-panel + Y INPUT connector.

- Trigger the ramp generator from the square-wave generator.

NOTE

Be sure to replace grounding caps on all unused X, Y, and Z INPUT connectors.

- Connect the test oscilloscope vertical input to the T connector at the output of the square-wave generator.
- Set the square-wave generator for a 1-kilohertz, 1-volt output as indicated on the test oscilloscope.
- ADJUST—R415 (Y Gain) for an 8-division square-wave display on the 607 as shown in Figure 6-1.

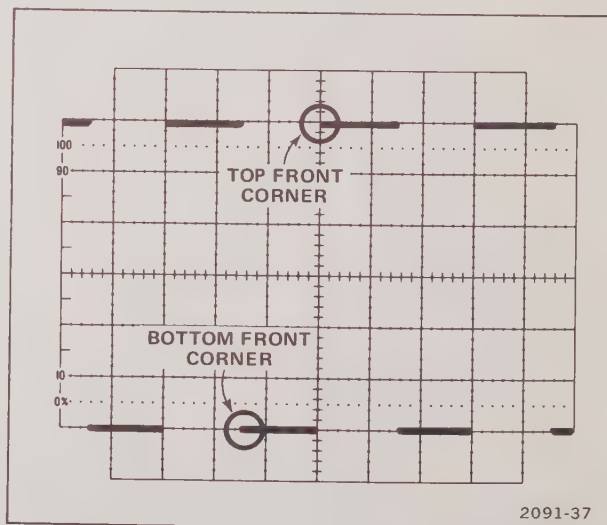


Figure 6-1. Typical display for adjusting vertical compensation.

✓ **Performance Requirement check; see introductory information.**

h. Set S400 (+ Y Atten) and S500 (– Y Atten) to the 5X (down) position.

i. Set the square-wave generator amplitude for a 6 division display on the 607.

j. ADJUST—C400 (+ Y Atten Comp) for an optimum square top front corner on the 607 display (see Fig. 6-1). For best accuracy, position the display corner of interest to graticule center.

k. Disconnect the square-wave signal from the + Y INPUT connector and connect it to the – Y INPUT connector.

l. ADJUST—C500 (– Y Atten Comp) for an optimum square bottom front corner on the 607 display (see Fig. 6-1). For best accuracy, position the display corner of interest to graticule center.

m. Set S400 (+ Y Atten) and S500 (– Y Atten) to the 1X (up) position.

n. Set the square-wave generator for a 100-kilohertz, 0.7 volt output as indicated on the test oscilloscope.

o. Set the ramp generator for a 50-microsecond duration ramp output.

p. Disconnect the square-wave signal from the – Y INPUT connector and connect it to the + Y INPUT connector.

q. ADJUST—C446 (Y HF Comp) for an optimum square front corner on the 607 display (see Fig. 6-1). For best accuracy, position the display corner of interest to graticule center.

✓ C2. ADJUST HORIZONTAL (X) GAIN AND COMPENSATION (R215, C200, AND C300)

NOTE

The X gain is normally set to provide 8 divisions of deflection, depending upon the input signal amplitude. The following procedure adjusts the X gain so that 1 volt provides 8 divisions of deflection. If the gain adjustment is changed, the + X and – X attenuator compensation should be readjusted to optimize square-wave response.

✓Performance Requirement check; see introductory information.

a. Disconnect the ramp signal from the + X INPUT connector and connect it to the + Y INPUT connector.

b. Disconnect the square-wave signal from the + Y INPUT connector and connect it to the + X INPUT connector.

NOTE

Be sure to replace grounding caps on unused rear-panel X, Y, and Z INPUT connectors.

c. Set the square-wave generator for a 1-kilohertz, 1-volt output as indicated on the test oscilloscope.

d. Set the ramp generator for a positive-going, 5-millisecond ramp signal at approximately 2 volts amplitude.

e. ADJUST—R215 (X Gain) for an 8-division display on the 607 as shown in Figure 6-2.

f. Set S200 (+ Y Atten) and S300 (– Y Atten) to the 5X (down) position.

g. Set the square-wave generator amplitude for an 8 division horizontal display on the 607.

h. ADJUST—C200 (+ X Atten Comp) for an optimum square right bottom corner on the 607 display (see Fig. 6-2). For best accuracy, position the display corner of interest to graticule center.

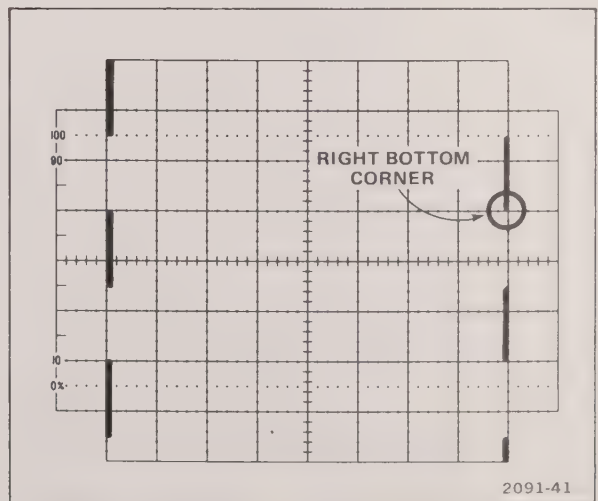


Figure 6-2. Typical display for adjusting horizontal compensation.

Performance Check and Adjustment—607

i. Disconnect the square-wave signal from the + X INPUT connector and connect it to the - X INPUT connector.

j. ADJUST—C300 (- X Atten Comp) for an optimum square right bottom corner on the 607 display (see Fig. 6-2). For best accuracy, position the display corner of interest to graticule center.

k. Set S200 (+ X Atten) and S300 (- X Atten) to the 1X (up) position.

l. Set the square-wave generator for a 100-kilohertz, 0.7-volt output as indicated on the test oscilloscope.

m. Set the ramp generator for a 50-microsecond duration ramp output.

n. Disconnect the square-wave signal from the - X INPUT connector and connect it to the + X INPUT connector.

o. ADJUST—C246 (X HF Comp) for an optimum square right bottom corner on the 607 display (see Fig. 6-2). For best accuracy, position the display corner of interest to graticule center.

✓ C3. CHECK HORIZONTAL AND VERTICAL BANDWIDTH

a. Disconnect the square-wave generator and test oscilloscope from the + X INPUT connector.

b. Set the sine-wave generator for a 50-kilohertz output at approximately 1-volt amplitude.

c. Connect the sine-wave generator to the + X INPUT connector.

d. Set the sine-wave generator amplitude and 607 Position controls for a centered 8-division display.

e. Slowly increase the sine-wave generator frequency until the display amplitude is 5.66 divisions.

✓ f. CHECK—That the sine-wave generator frequency is at least 3 megahertz.

g. Disconnect the ramp and sine-wave generators from the + Y INPUT and + X INPUT connectors.

h. Connect the ramp generator to the + X INPUT connector and the sine-wave generator to the + Y INPUT connector.

i. Set the sine-wave generator for a 50-kilohertz output.

j. Set the sine-wave generator amplitude and 607 Position controls for a centered 6.4 division display.

k. Slowly increase the sine-wave generator frequency until the display amplitude is 4.5 divisions.

✓ l. CHECK—That the sine-wave generator frequency is at least 3 megahertz.

✓ C4. CHECK HORIZONTAL AND VERTICAL PHASE DIFFERENCE

a. Disconnect the ramp generator from the + X INPUT connector and connect the sine-wave generator through the T connector to both the + Y INPUT and + X INPUT connectors.

b. Set the sine-wave generator frequency for 50 kilohertz.

c. Set the sine-wave generator amplitude and the 607 Position controls for an 8-division diagonal display as shown in Figure 6-3.

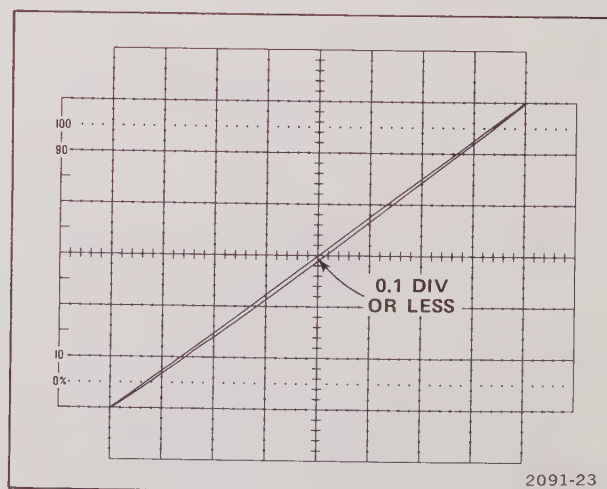


Figure 6-3. Typical horizontal and vertical phase difference display.

✓ Performance Requirement check; see introductory information.

- d. Set the sine-wave generator frequency for 500 kilohertz.
- ✓ e. CHECK—That the diameter of the displayed ellipse measured vertically at the center of the graticule is 0.1 division or less (see Fig. 6-3). If necessary, adjust C470 (Phasing) to reduce phase shift.

f. INTERACTION—C470 (Phasing) affects the vertical amplifier frequency compensation. If adjustment was necessary in part (e), repeat the Vertical (Y) Gain and Compensation procedures in step C1.

NOTE

It may be necessary to make a slight compromise between the Y HF compensation adjustment in step C1 and the phasing adjustment in part (e).

D. Z-AXIS AMPLIFIER

Equipment Required

- | | |
|--------------------------|--|
| 1. Test oscilloscope | 6. 10X probe |
| 2. Ramp generator | 7. 50-ohm cables (2) |
| 3. Square-wave generator | 8. 50-ohm termination (optional, depending on test equipment used) |
| 4. Sine-wave generator | |
| 5. BNC T connector | |

BEFORE YOU BEGIN, see

TEST POINT AND
ADJUSTMENT LOCATIONS

in the Diagrams and Circuit Board Illustrations section.

NOTE

Perform the Preliminary Procedure before making the following checks and adjustments.

NOTE

The preceding procedure sets the Z-Axis Amplifier gain for a full intensity range of +1 volt. This procedure can be repeated for any input voltage up to +5 volts to provide the desired Z-axis sensitivity.

✓ D1. ADJUST Z-AXIS GAIN AND COMPENSATION (R615 AND C734)

- | | |
|---|--|
| <p>a. Apply a 1 volt positive-going, 200-microsecond (20 microseconds/division) ramp signal from the ramp generator to the + X INPUT connector.</p> <p>b. Apply a negative-going, 50-kilohertz square wave from the square-wave generator through the T connector to the + Z INPUT connector.</p> <p>c. Trigger the ramp generator from the square wave generator.</p> <p>d. Connect the test oscilloscope to the T connector at the output of the square-wave generator.</p> <p>e. Set the square-wave generator amplitude for 1 volt peak-to-peak as indicated on the test oscilloscope.</p> <p>f. Set the 607 INTENSITY control to the fully clockwise position.</p> <p>g. ADJUST—R615 (Z Gain) for bright line segments that are completely blanked between each segment.</p> | <p>h. Reduce the display intensity and disconnect the square-wave generator from the + Z INPUT connector.</p> <p>i. Set the test oscilloscope deflection factor for 5 volts/division and sweep rate for 1 microsecond/division.</p> <p>j. Connect the 10X probe from the test oscilloscope vertical input to test point TP720.</p> <p>k. Set the 607 INTENSITY control for a 10-volt dc level at test point TP720 as indicated on the test oscilloscope.</p> <p>l. Apply a positive-going, symmetrical, 100-kilohertz square wave from the square-wave generator to the + Z INPUT connector.</p> <p>m. Set the square-wave generator amplitude for a 4-division display on the test oscilloscope.</p> <p>n. ADJUST—C734 (Z HF Comp) for an optimum square front corner on the test oscilloscope display.</p> |
|---|--|

✓Performance Requirement check; see introductory information.

✓ D2. CHECK Z AXIS BANDWIDTH

a. Disconnect the square-wave generator from the + Z INPUT connector.

b. Set the 607 INTENSITY control for a +30-volt dc level at test point TP720 as indicated on the test oscilloscope.

c. Apply a 50-kilohertz sine wave from the sine-wave generator (if necessary, through the 50-ohm termination) to the + Z INPUT connector.

d. Set the sine-wave generator amplitude for an 8-division free-running display on the test oscilloscope.

e. Slowly increase the sine-wave generator frequency until the test oscilloscope display amplitude is 5.66 divisions.

✓ f. CHECK—That the sine-wave generator frequency is at least 5 megahertz.

g. Disconnect the test equipment.

✓Performance Requirement check; see introductory information.

E. STORAGE CIRCUIT

Equipment Required

- | | |
|-----------------------|-----------------------|
| 1. Test oscilloscope | 5. 50-ohm termination |
| 2. Pulse generator | 6. 5X attenuator |
| 3. Ramp generator (2) | |
| 4. 10X probe | |

BEFORE YOU BEGIN, see

TEST POINT AND
ADJUSTMENT LOCATIONS

in the Diagrams and Circuit Board Illustrations section.

NOTE

Perform the Preliminary Procedure before making the following checks and adjustments.

E1. ADJUST COLLIMATION (R1030, R1054, AND R1042)

- Set the INTENSITY control fully counterclockwise and check that there is no display.
- Push the STORE button.
- Turn the OPERATE LEVEL control fully clockwise.
- Set R835 (Prep Level) fully counterclockwise and R965 (Op Level) fully clockwise.
- ADJUST—R1030 (CE1), R1054 (CE2), and R1042 (CE3) alternately until the brightened storage area does not have any shadowed corners or scallops.

d. ADJUST—R835 (Prep Level) clockwise in small increments, while pushing and releasing the ERASE button after each increment, until the display area brightness just begins to decrease.

e. ADJUST—R965 (Op Level) counterclockwise in small increments, while pushing and releasing the ERASE button after each increment, until a slight glow remains on the display area.

E3. ADJUST PULSE HEIGHT (R975)

- Connect the 10X probe from the test oscilloscope vertical input to test point TP1066.
- Turn the PERSISTENCE/SAVE TIME control clockwise until a waveform is displayed on the test oscilloscope.
- Push and hold the ERASE button in.
- Note the dc (prepare) level of the test oscilloscope display and release the ERASE button.
- ADJUST—R975 (Pulse Ht) until the top of the waveform is 1 volt above the dc (prepare) level noted in part (d).

E2. ADJUST STORAGE LEVELS (R835 AND R965)

- Set R965 (Op Level) fully counterclockwise.
- ADJUST—R965 (Op Level) clockwise in small increments while pushing and releasing the ERASE button after each increment until the display area just reaches a uniformly bright condition. (Further adjustment will make the display area brighter but will degrade performance).
- Push and release the ERASE button.

✓ E4. CHECK STORED DOT WRITING TIME

NOTE

For the 607 Option 4, disconnect the internal sweep by setting S220 (Int Swp) and S735 (Int Blank) to the X-Y position. See Connecting the Internal Sweep (Option 4) in section 3, Installation, for additional information.

- a. Push in the PERSISTENCE/SAVE TIME control and turn it fully counterclockwise.
- b. Push and release the ERASE button.
- c. Turn the OPERATE LEVEL control until the crt background glow just disappears.
- d. Set the INTENSITY control for a bright stored dot displayed on the crt.
- e. Position the displayed dot to the lower left corner of the graticule with the vertical and horizontal Position controls.
- f. Set the INTENSITY control fully counterclockwise.
- g. Apply a 1-second duration automatically-triggered, positive-going ramp from a ramp generator to the + Y INPUT connector.
- h. Apply the gate output signal from the ramp generator through the 5X attenuator to the + Z INPUT connector.
- i. Apply a 50-millisecond duration automatically-triggered, positive-going ramp from a second ramp generator to the + X INPUT connector.
- j. Turn the INTENSITY control clockwise until a display appears.
- k. Set both ramp generator output amplitudes for a 6 X 8 division display.
- l. Alternately push the ERASE button and turn the INTENSITY control counterclockwise, in small increments, until the display just disappears.
- m. Apply a minimum-amplitude, negative-going, 1-microsecond duration, 1-millisecond period pulse from the pulse generator through a 50-ohm termination to the — Z INPUT connector.
- n. Connect the 10X probe from the test oscilloscope vertical input to test point TP720 and set the sweep rate for 1 microsecond/division.
- o. Slowly increase the pulse generator output amplitude for a 30-volt peak-to-peak display on the test oscilloscope.
- p. Set the ramp generator (connected to the + Y INPUT connector) for normal triggering.
- q. Push the ERASE button and check for no display.
- r. Turn the ramp generator (connected to the + Y INPUT connector) triggering level from one extreme to the other until a 6 X 8 division dot display appears on the crt.
- ✓ s. CHECK—That the 6 X 8 division dot display remains for at least 3 minutes.
- t. Set the pulse generator for a 0.5-microsecond duration pulse output.
- u. Push and release the ERASE button.
- v. Set the OPERATE LEVEL control fully clockwise.
- w. Turn the ramp generator (connected to the + Y INPUT connector) triggering level from one extreme to the other until a 6 X 8 division dot display appears on the crt.
- ✓ x. CHECK—That the 6 X 8 division display remains for at least 15 seconds.

✓ E5. CHECK STORED LINEAR WRITING SPEED

- a. Remove the pulse generator from the — Z INPUT connector and replace the grounding cap.

✓ Performance Requirement check; see introductory information.

- b. Remove the 5X attenuator from the gate output of the ramp generator connected to the + Y INPUT connector and apply the gate output directly to the + Z INPUT connector.
- c. Set the ramp generator connected to the + Y INPUT connector for approximately a 300-microsecond duration, automatically triggered, ramp output.
- d. Set the ramp generator connected to the + X INPUT connector for a 10-microsecond duration ramp output.
- e. Set the ramp amplitude of both ramp generators for a 6 X 8 division stored display (push and release the ERASE button after each amplitude change).
- f. Connect the 10X probe from the test oscilloscope vertical input to test point TP720 and set the test oscilloscope sweep rate for 0.1 millisecond/division.
- g. Turn the 607 INTENSITY control for a +60-volt dc level displayed on the test oscilloscope.
- h. Set the ramp generator connected to the + Y INPUT connector for normal triggering.
- i. Push and release the ERASE button.
- j. Turn the triggering level on the ramp generator connected to the + Y INPUT connector from one extreme to the other until a 6 X 8 division display of stored lines appears on the 607 crt.
- ✓ k. CHECK—That the stored lines are visible without any gaps or breaks for at least 1 minute.
- l. Disconnect the test equipment.

F. SWEEP GENERATOR (OPTION 4)

Equipment Required

- | | |
|------------------------|-----------------------|
| 1. Sine-wave generator | 4. 50-ohm termination |
| 2. Time-mark generator | |
| 3. 50-ohm cable | |

BEFORE YOU BEGIN, see

TEST POINT AND
ADJUSTMENT LOCATIONS

in the Diagrams and Circuit Board Illustrations section.

NOTE

Perform the Preliminary Procedure before making the following checks and adjustments.

F1. ADJUST SWEEP LENGTH (R1115)

- a. Set the Option 4 controls as follows:

Int Swp (Deflection Amplifier board) Y-T (up position)
 Int Blank (Z-Axis Amplifier board) Y-T (right position)
 Trig Mode (Sweep board) Auto (rear position)
 SEC/DIV 1 μ
 VARIABLE Fully clockwise (calibrated)

- b. Set INTENSITY control for a barely visible trace.

- c. ADJUST—R1115 (Swp Length) for a sweep length of approximately 10.5 divisions.

✓ F2. CHECK TRIGGER SLOPE/LEVEL

- a. Apply a 2-megahertz sine-wave signal from the sine-wave generator to the + Y INPUT connector.

- b. Set the sine-wave generator amplitude for a 0.5 division display.

- ✓ c. CHECK—That a stable display can be obtained by turning the TRIG SLOPE/LEVEL control.

✓ Performance Requirement check; see introductory information.

- ✓ d. CHECK—For a free-running display when the TRIG SLOPE/LEVEL control is set fully clockwise and fully counterclockwise.

- e. Set S1109 (Trig Mode) to Norm.

- ✓ f. CHECK—That a stable display can be obtained by turning the TRIG SLOPE/LEVEL control.

- ✓ g. CHECK—For no display when the TRIG SLOPE/LEVEL control is set fully clockwise and fully counterclockwise.

- h. Set S1109 (Trig Mode) to Auto.

- i. Disconnect the sine-wave generator.

✓ F3. ADJUST SWEEP TIMING (R1165)

- a. Set the SEC/DIV switch to 1 m.

- b. Apply 1-millisecond markers from the time-mark generator through the 50-ohm termination to the + Y INPUT connector.

- c. Set the time-mark generator amplitude (or attach attenuators) for a 2- to 6-division display.

- d. Position the first time marker to the left edge of the graticule and check for 1 time marker per graticule division.

- ✓ e. CHECK—That the distance between the second and tenth time marker is 8 divisions within 0.24 division (3%).

f. ADJUST—R1165 (Swp Cal) so that the second and tenth markers are exactly 8 divisions apart.

✓ g. CHECK—Remaining SEC/DIV switch positions with time markers that correspond to each switch position. The distance between the second and tenth time marker at each SEC/DIV switch position should be 8 divisions within 0.24 division (3%).

✓ **F4. CHECK VARIABLE TIME/DIVISION**

a. Set the time-mark generator for 0.1 millisecond markers.

b. Set the SEC/DIV switch to 0.1 m and check for 1 time marker per division.

c. Set the front-panel VARIABLE adjustment fully counterclockwise.

d. Set the SEC/DIV switch to 10 μ .

✓ e. CHECK—For at least 1 time marker per graticule division.

f. Disconnect all test equipment.

NOTE

For X-Y operation, return the Int Swp and Int Blank switches on the Deflection and Z-Axis Amplifier boards to the X-Y position.

This completes the Performance Check and Adjustment Procedure.

REPLACEABLE ELECTRICAL PARTS

PARTS ORDERING INFORMATION

Replacement parts are available from or through your local Tektronix, Inc. Field Office or representative.

Changes to Tektronix instruments are sometimes made to accommodate improved components as they become available, and to give you the benefit of the latest circuit improvements developed in our engineering department. It is therefore important, when ordering parts, to include the following information in your order: Part number, instrument type or number, serial number, and modification number if applicable.

If a part you have ordered has been replaced with a new or improved part, your local Tektronix, Inc. Field Office or representative will contact you concerning any change in part number.

Change information, if any, is located at the rear of this manual.

SPECIAL NOTES AND SYMBOLS

X000	Part first added at this serial number
00X	Part removed after this serial number

ITEM NAME

In the Parts List, an Item Name is separated from the description by a colon (:). Because of space limitations, an Item Name may sometimes appear as incomplete. For further Item Name identification, the U.S. Federal Cataloging Handbook H6-1 can be utilized where possible.

ABBREVIATIONS

ACTR	ACTUATOR	PLSTC	PLASTIC
ASSY	ASSEMBLY	QTZ	QUARTZ
CAP	CAPACITOR	RECP	RECEPTACLE
CER	CERAMIC	RES	RESISTOR
CKT	CIRCUIT	RF	RADIO FREQUENCY
COMP	COMPOSITION	SEL	SELECTED
CONN	CONNECTOR	SEMICOND	SEMICONDUCTOR
ELCTLT	ELECTROLYTIC	SENS	SENSITIVE
ELEC	ELECTRICAL	VAR	VARIABLE
INCAND	INCANDESCENT	WW	WIREWOUND
LED	LIGHT EMITTING DIODE	XFMR	TRANSFORMER
NONWIR	NON WIREWOUND	XTAL	CRYSTAL

CROSS INDEX MFR. CODE NUMBER TO MANUFACTURER

MFR.CODE	MANUFACTURER	ADDRESS	CITY,STATE,ZIP
00853	SANGAMO ELECTRIC CO., S. CAROLINA DIV.	P. O. BOX 128	PICKENS, SC 29671
01121	ALLEN-BRADLEY CO.	1201 2ND ST. SOUTH	MILWAUKEE, WI 53204
01295	TEXAS INSTRUMENTS, INC., SEMICONDUCTOR GROUP	P. O. BOX 5012	DALLAS, TX 75222
02735	RCA CORP., SOLID STATE DIVISION	ROUTE 202	SOMERVILLE, NY 08876
03888	KDI PYROFILM CORP.	60 S. JEFFERSON RD.	WHIPPANY, NJ 07981
04222	AVX CERAMICS., DIVISION OF AVX CORP.	P.O. BOX 867, 19TH AVE. SOUTH	MURTLE BEACH, SC 29577
04713	MOTOROLA, INC., SEMICONDUCTOR PRODUCTS DIV.	5005 E. MCDOWELL RD.	PHOENIX, AZ 85036
07263	FAIRCHILD SEMICONDUCTOR, A DIV. OF FAIRCHILD CAMERA AND INSTRUMENT CORP.	464 ELLIS ST.	MOUNTAIN VIEW, CA 94042
07910	TELEDYNE SEMICONDUCTOR	12515 CHADRON AVE.	HAWTHORNE, CA 90250
08806	GENERAL ELECTRIC CO., MINIATURE LAMP PRODUCTS DEPT.	NELA PK.	CLEVELAND, OH 44112
10389	CHICAGO SWITCH, INC.	2035 WABANSIA AVE.	CHICAGO, IL 60647
11237	CTS KEENE, INC.		PASO ROBLES, CA 93446
12969	UNITRODE CORP.	580 PLEASANT ST.	WATERTOWN, MA 02172
14936	GENERAL INSTRUMENT CORP., SEMICONDUCTOR PRODUCTS GROUP	P.O. BOX 600, 600 W. JOHN ST.	HICKSVILLE, NY 11802
15818	TELEDYNE SEMICONDUCTOR	1300 TERRA BELLA AVE.	MOUNTAIN VIEW, CA 94043
24931	SPECIALTY CONNECTOR CO., INC.	3560 MADISON AVE.	INDIANAPOLIS, IN 46227
27014	NATIONAL SEMICONDUCTOR CORP.	2900 SAN YSIDRO WAY	SANTA CLARA, CA 95051
52306	HIGH VOLTAGE DEVICES, INC.	7485 AVENUE 304	VISALIA, CA 93277
56289	SPRAGUE ELECTRIC CO.		NORTH ADAMS, MA 01247
71400	BUSSMAN MFG., DIVISION OF MCGRAW- EDISON CO.	2536 W. UNIVERSITY ST.	ST. LOUIS, MO 63107
71468	ITT CANNON ELECTRIC	666 E. DYER RD.	SANTA ANA, CA 92702
72982	ERIE TECHNOLOGICAL PRODUCTS, INC.	644 W. 12TH ST.	ERIE, PA 16512
73138	BECKMAN INSTRUMENTS, INC., HELIPOT DIV.	2500 HARBOR BLVD.	FULLERTON, CA 92634
75042	TRW ELECTRONIC COMPONENTS, IRC FIXED RESISTORS, PHILADELPHIA DIVISION	401 N. BROAD ST.	PHILADELPHIA, PA 19108
76493	BELL INDUSTRIES, INC., MILLER, J. W., DIV.	P O BOX 5825, 19070 REYES AVE.	COMPTON, CA 90224
79727	C-W INDUSTRIES	550 DAVISVILLE RD., P O BOX 96	WARMINISTER, PA 18974
80009	TEKTRONIX, INC.	P. O. BOX 500	BEAVERTON, OR 97005
80031	ELECTRA-MIDLAND CORP., MEPCO DIV., A NORTH AMERICAN PHILIPS CO.	22 COLUMBIA RD.	MORRISTOWN, NJ 07960
80740	BECKMAN INSTRUMENTS, INC.	2500 HARBOR BLVD.	FULLERTON, CA 92634
81483	INTERNATIONAL RECTIFIER CORP.	9220 SUNSET BLVD.	LOS ANGELES, CA 90069
83003	VARO, INC.	P O BOX 411, 2203 WALNUT ST.	GARLAND, TX 75040
90201	MALLORY CAPACITOR CO., DIV. OF P. R. MALLORY CO., INC.	3029 E. WASHINGTON ST.	INDIANAPOLIS, IN 46206
91637	DALE ELECTRONICS, INC.	P. O. BOX 609	COLUMBUS, NB 68601
91929	HONEYWELL, INC., MICRO SWITCH DIV.	CHICAGO & SPRING STS.	FREEMPORT, IL 61032
93410	ESSEX INTERNATIONAL, INC., CONTROLS DIV. LEXINGTON PLANT	P. O. BOX 1007	MANSFIELD, OH 44903

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A1	670-3125-02			CKT BOARD ASSY:POWER SUPPLY	80009	670-3125-02
A2	670-4515-00			CKT BOARD ASSY:HIGH VOLTAGE	80009	670-4515-00
A3	670-3178-02			CKT BOARD ASSY:DEFLECTION	80009	670-3178-02
A4	670-3182-01			CKT BOARD ASSY:Z AXIS	80009	670-3182-01
A5	670-4516-00			CKT BOARD ASSY:STORAGE	80009	670-4516-00
C18	290-0702-00			CAP.,FXD,ELCTLT:2000UF,+100-0%,50V	56289	68D10715
C20	290-0571-00			CAP.,FXD,ELCTLT:5000UF,+100-0%,25V	90201	20-36043
C21	290-0571-00			CAP.,FXD,ELCTLT:5000UF,+100-0%,25V	90201	20-36043
C36	290-0559-00			CAP.,FXD,ELCTLT:22UF,20%,35V	56289	196D226X0035MA1
C40	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-547E103Z
C46	281-0525-00			CAP.,FXD,CER DI:470PF,+/-94PF,500V	04222	7001-1364
C58	281-0543-00			CAP.,FXD,CER DI:270PF,10%,500V	72982	301055X5P271K
C60	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-547E103Z
C62	290-0535-00			CAP.,FXD,ELCTLT:33UF,20%,10V	56289	196D336X0010KA1
C78	281-0524-00			CAP.,FXD,CER DI:150PF,+/-30PF,500V	04222	7001-1381
C88	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-547E103Z
C90	290-0528-00			CAP.,FXD,ELCTLT:15UF,20%,50V	90201	TDC156M050WLC
C104	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8131N075651104M
C106	283-0021-00			CAP.,FXD,CER DI:0.001UF,20%,5000V	72982	828-005Y5S0102M
C112	290-0527-00			CAP.,FXD,ELCTLT:15UF,20%,20V	90201	TDC156M020NLF
C114	283-0142-00			CAP.,FXD,CER DI:0.0027UF,5%,200V	72982	875-551B272J
C117	283-0081-00			CAP.,FXD,CER DI:0.1UF,+80-20%,25V	56289	36C600
C118	283-0010-00			CAP.,FXD,CER DI:0.05UF,+100-20%,50V	56289	273C20
C126	290-0536-00			CAP.,FXD,ELCTLT:10UF,20%,25V	90201	TDC106M025NLF
C128	290-0536-00			CAP.,FXD,ELCTLT:10UF,20%,25V	90201	TDC106M025NLF
C132	283-0000-00			CAP.,FXD,CER DI:0.001UF,+100-0%,500V	72982	831-516E102P
C148	283-0105-00			CAP.,FXD,CER DI:0.01UF,+80-20%,2000V	56289	41C316
C149	283-0105-00			CAP.,FXD,CER DI:0.01UF,+80-20%,2000V	56289	41C316
C150	281-0512-00			CAP.,FXD,CER DI:27PF,+/-2.7PF,500V	72982	308-000COG0270K
C154	283-0057-00			CAP.,FXD,CER DI:0.1UF,+80-20%,200V	56289	274C10
C156	283-0057-00			CAP.,FXD,CER DI:0.1UF,+80-20%,200V	56289	274C10
C158	290-0164-00			CAP.,FXD,ELCTLT:1UF,+50-10%,150V	56289	30D105F150BA2
C160	290-0164-00			CAP.,FXD,ELCTLT:1UF,+50-10%,150V	56289	30D105F150BA2
C164	283-0178-00			CAP.,FXD,CER DI:0.1UF,+80-20%,100V	72982	8131N145651104Z
C170	283-0178-00			CAP.,FXD,CER DI:0.1UF,+80-20%,100V	72982	8131N145651104Z
C180	283-0105-00			CAP.,FXD,CER DI:0.01UF,+80-20%,2000V	56289	41C316
C186	283-0021-00			CAP.,FXD,CER DI:0.001UF,20%,5000V	72982	828-005Y5S0102M
C188	290-0164-00			CAP.,FXD,ELCTLT:1UF,+50-10%,150V	56289	30D105F150BA2
C200	281-0203-00			CAP.,VAR,PLSTC:2-10PF,100V	80031	C010EA/10E
C202	281-0510-00			CAP.,FXD,CER DI:22PF,+/-4.4PF,500V	72982	301-000COG0220M
C206	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-547E103Z
C212	281-0544-00			CAP.,FXD,CER DI:5.6PF,10%,500V	72982	301-000COH0569D
C218	281-0518-00			CAP.,FXD,CER DI:47PF,+/-9.4PF,500V	72982	301-000U2J0470M
C246	281-0203-00			CAP.,VAR,PLSTC:2-10PF,100V	80031	C010EA/10E
C250	281-0661-00			CAP.,FXD,CER DI:0.8PF,+/-0.1PF,500V	72982	301-000COK0808B
C256	281-0628-00			CAP.,FXD,CER DI:15PF,5%,600V	72982	301-000COG0150J
C300	281-0203-00			CAP.,VAR,PLSTC:2-10PF,100V	80031	C010EA/10E
C302	281-0510-00			CAP.,FXD,CER DI:22PF,+/-4.4PF,500V	72982	301-000COG0220M
C306	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-547E103Z
C312	281-0544-00			CAP.,FXD,CER DI:5.6PF,10%,500V	72982	301-000COH0569D
C320	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-547E103Z
C326	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-547E103Z
C350	281-0661-00			CAP.,FXD,CER DI:0.8PF,+/-0.1PF,500V	72982	301-000COK0808B

Replaceable Electrical Parts—607

Ckt No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Name & Description	Mfr Code	Mfr Part Number
C380	290-0572-00		CAP.,FXD,ELCTLT:0.1UF,20%,50V	56289	196D104X0050HA1
C382	290-0534-00		CAP.,FXD,ELCTLT:1UF,20%,35V	56289	196D105X0035HA1
C384	290-0572-00		CAP.,FXD,ELCTLT:0.1UF,20%,50V	56289	196D104X0050HA1
C400	281-0203-00		CAP.,VAR,PLSTC:2-10PF,100V	80031	C010EA/10E
C402	281-0510-00		CAP.,FXD,CER DI:22PF,+/-4.4PF,500V	72982	301-000C0G0220M
C406	283-0003-00		CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-547E103Z
C412	281-0544-00		CAP.,FXD,CER DI:5.6PF,10%,500V	72982	301-000C0H0569D
C418	281-0518-00		CAP.,FXD,CER DI:47PF,+/-9.4PF,500V	72982	301-000U2J0470M
C442	281-0526-00		CAP.,FXD,CER DI:1.5PF,+/-0.5PF,500V	72982	301-000S2K0159D
C446	281-0203-00		CAP.,VAR,PLSTC:2-10PF,100V	80031	C010EA/10E
C450	281-0534-00		CAP.,FXD,CER DI:3.3PF,+/-0.25PF,500V	72982	301-000C0J0339C
C456	283-0663-00		CAP.,FXD,MICA D:16.8PF,+/-0.5PF,500V	00853	D155C16.8D0
C470	281-0203-00		CAP.,VAR,PLSTC:2-10PF,100V	80031	C010EA/10E
C500	281-0203-00		CAP.,VAR,PLSTC:2-10PF,100V	80031	C010EA/10E
C502	281-0510-00		CAP.,FXD,CER DI:22PF,+/-4.4PF,500V	72982	301-000C0G0220M
C506	283-0003-00		CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-547E103Z
C512	281-0544-00		CAP.,FXD,CER DI:5.6PF,10%,500V	72982	301-000C0H0569D
C520	283-0003-00		CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-547E103Z
C526	283-0003-00		CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-547E103Z
C550	281-0534-00		CAP.,FXD,CER DI:3.3PF,+/-0.25PF,500V	72982	301-000C0J0339C
C606	283-0003-00		CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-547E103Z
C612	281-0508-00		CAP.,FXD,CER DI:12PF,+/-0.6PF,500V	72982	301-000C0G0120J
C614	281-0549-00		CAP.,FXD,CER DI:68PF,10%,500V	72982	301-000U2J0680K
C642	283-0003-00		CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-547E103Z
C656	283-0003-00		CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-547E103Z
C662	281-0508-00		CAP.,FXD,CER DI:12PF,+/-0.6PF,500V	72982	301-000C0G0120J
C670	290-0534-00		CAP.,FXD,ELCTLT:1UF,20%,35V	56289	196D105X0035HA1
C690	281-0534-00		CAP.,FXD,CER DI:3.3PF,+/-0.25PF,500V	72982	301-000C0J0339C
C692	281-0526-00		CAP.,FXD,CER DI:1.5PF,+/-0.5PF,500V	72982	301-000S2K0159D
C716	281-0629-00		CAP.,FXD,CER DI:33PF,5%,600V	72982	308-000C0G0330J
C718	283-0003-00		CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-547E103Z
C724	283-0057-00		CAP.,FXD,CER DI:0.1UF,+80-20%,200V	56289	274C10
C734	281-0064-00		CAP.,VAR,PLSTC:0.25-1.5PF,600V	72982	530-002
C740	283-0057-00		CAP.,FXD,CER DI:0.1UF,+80-20%,200V	56289	274C10
C810	290-0572-00		CAP.,FXD,ELCTLT:0.1UF,20%,50V	56289	196D104X0050HA1
C812	283-0081-00		CAP.,FXD,CER DI:0.1UF,+80-20%,25V	56289	36C600
C814	290-0534-00		CAP.,FXD,ELCTLT:1UF,20%,35V	56289	196D105X0035HA1
C816	283-0003-00		CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-547E103Z
C820	290-0536-00		CAP.,FXD,ELCTLT:10UF,20%,25V	90201	TDC106M025NLF
C840	290-0534-00		CAP.,FXD,ELCTLT:1UF,20%,35V	56289	196D105X0035HA1
C848	290-0529-00		CAP.,FXD,ELCTLT:47UF,20%,20V	56289	196D476X0020LA3
C886	285-0686-00		CAP.,FXD,PLSTC:0.068UF,10%,100V	56289	410P108
C890	290-0535-00		CAP.,FXD,ELCTLT:33UF,20%,10V	56289	196D336X0010KA1
C895	285-0686-00		CAP.,FXD,PLSTC:0.068UF,10%,100V	56289	410P108
C904	290-0534-00		CAP.,FXD,ELCTLT:1UF,20%,35V	56289	196D105X0035HA1
C1062	281-0627-00		CAP.,FXD,CER DI:1PF,+/-0.25PF,500V	72982	301-000C0K0109C
CR15	152-0066-00		SEMICOND DEVICE:SILICON,400V,750MA	02735	37304
CR16	152-0066-00		SEMICOND DEVICE:SILICON,400V,750MA	02735	37304
CR17	152-0066-00		SEMICOND DEVICE:SILICON,400V,750MA	02735	37304
CR18	152-0066-00		SEMICOND DEVICE:SILICON,400V,750MA	02735	37304
CR20	152-0556-00		SEMICOND DEVICE:BRIDGE,50V,2.5A	04713	MDA960-1
CR25	152-0107-00		SEMICOND DEVICE:SILICON,375V,400MA	80009	152-0107-00

Ckt No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Name & Description	Mfr Code	Mfr Part Number
CR27	152-0107-00		SEMICON D DEVICE:SILICON,375V,400MA	80009	152-0107-00
CR29	152-0066-00		SEMICON D DEVICE:SILICON,400V,750MA	02735	37304
CR30	152-0141-02		SEMICON D DEVICE:SILICON,30V,150MA	07910	1N4152
CR32	152-0066-00		SEMICON D DEVICE:SILICON,400V,750MA	02735	37304
CR36	152-0066-00		SEMICON D DEVICE:SILICON,400V,750MA	02735	37304
CR40	152-0141-02		SEMICON D DEVICE:SILICON,30V,150MA	07910	1N4152
CR41	152-0141-02		SEMICON D DEVICE:SILICON,30V,150MA	07910	1N4152
CR48	152-0141-02		SEMICON D DEVICE:SILICON,30V,150MA	07910	1N4152
CR74	152-0141-02		SEMICON D DEVICE:SILICON,30V,150MA	07910	1N4152
CR80	152-0141-02		SEMICON D DEVICE:SILICON,30V,150MA	07910	1N4152
CR90	152-0066-00		SEMICON D DEVICE:SILICON,400V,750MA	02735	37304
CR106	152-0333-00		SEMICON D DEVICE:SILICON,55V,200MA	80009	152-0333-00
CR107	152-0333-00		SEMICON D DEVICE:SILICON,55V,200MA	80009	152-0333-00
CR120	152-0141-02		SEMICON D DEVICE:SILICON,30V,150MA	07910	1N4152
CR148	152-0242-00		SEMICON D DEVICE:SILICON,225V,200MA	12969	NDP341
CR150	152-0409-00		SEMICON D DEVICE:SILICON,10KV,5MA	83003	VG-12X
CR154	152-0586-00		SEMICON D DEVICE:SILICON,600V,500MA	14936	RMP5060
CR158	152-0586-00		SEMICON D DEVICE:SILICON,600V,500MA	14936	RMP5060
CR164	152-0586-00		SEMICON D DEVICE:SILICON,600V,500MA	14936	RMP5060
CR180	152-0242-00		SEMICON D DEVICE:SILICON,225V,200MA	12969	NDP341
CR182	152-0242-00		SEMICON D DEVICE:SILICON,225V,200MA	12969	NDP341
CR186	152-0242-00		SEMICON D DEVICE:SILICON,225V,200MA	12969	NDP341
CR208	152-0246-00		SEMICON D DEVICE:SILICON,400PIV,200MA	07910	CD12676
CR254	152-0141-02		SEMICON D DEVICE:SILICON,30V,150MA	07910	1N4152
CR255	152-0141-02		SEMICON D DEVICE:SILICON,30V,150MA	07910	1N4152
CR256	152-0141-02		SEMICON D DEVICE:SILICON,30V,150MA	07910	1N4152
CR257	152-0141-02		SEMICON D DEVICE:SILICON,30V,150MA	07910	1N4152
CR270	152-0061-00		SEMICON D DEVICE:SILICON,175V,100MA	80009	152-0061-00
CR272	152-0061-00		SEMICON D DEVICE:SILICON,175V,100MA	80009	152-0061-00
CR308	152-0246-00		SEMICON D DEVICE:SILICON,400PIV,200MA	07910	CD12676
CR408	152-0246-00		SEMICON D DEVICE:SILICON,400PIV,200MA	07910	CD12676
CR420	152-0141-02		SEMICON D DEVICE:SILICON,30V,150MA	07910	1N4152
CR454	152-0141-02		SEMICON D DEVICE:SILICON,30V,150MA	07910	1N4152
CR455	152-0141-02		SEMICON D DEVICE:SILICON,30V,150MA	07910	1N4152
CR456	152-0141-02		SEMICON D DEVICE:SILICON,30V,150MA	07910	1N4152
CR457	152-0141-02		SEMICON D DEVICE:SILICON,30V,150MA	07910	1N4152
CR508	152-0246-00		SEMICON D DEVICE:SILICON,400PIV,200MA	07910	CD12676
CR520	152-0141-02		SEMICON D DEVICE:SILICON,30V,150MA	07910	1N4152
CR608	152-0246-00		SEMICON D DEVICE:SILICON,400PIV,200MA	07910	CD12676
CR620	152-0141-02		SEMICON D DEVICE:SILICON,30V,150MA	07910	1N4152
CR642	152-0141-02		SEMICON D DEVICE:SILICON,30V,150MA	07910	1N4152
CR658	152-0246-00		SEMICON D DEVICE:SILICON,400PIV,200MA	07910	CD12676
CR670	152-0141-02		SEMICON D DEVICE:SILICON,30V,150MA	07910	1N4152
CR698	152-0141-02		SEMICON D DEVICE:SILICON,30V,150MA	07910	1N4152
CR699	152-0141-02		SEMICON D DEVICE:SILICON,30V,150MA	07910	1N4152
CR730	152-0574-00		SEMICON D DEVICE:SILICON,120V	80009	152-0574-00
CR801	152-0141-02		SEMICON D DEVICE:SILICON,30V,150MA	07910	1N4152
CR802	152-0141-02		SEMICON D DEVICE:SILICON,30V,150MA	07910	1N4152
CR812	152-0141-02		SEMICON D DEVICE:SILICON,30V,150MA	07910	1N4152
CR814	152-0141-02		SEMICON D DEVICE:SILICON,30V,150MA	07910	1N4152
CR852	152-0141-02		SEMICON D DEVICE:SILICON,30V,150MA	07910	1N4152
CR853	152-0141-02		SEMICON D DEVICE:SILICON,30V,150MA	07910	1N4152
CR856	152-0141-02		SEMICON D DEVICE:SILICON,30V,150MA	07910	1N4152

Replaceable Electrical Parts—607

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
CR857	152-0141-02			SEMICON D DEVICE:SILICON,30V,150MA	07910	1N4152
CR860	152-0141-02			SEMICON D DEVICE:SILICON,30V,150MA	07910	1N4152
CR861	152-0141-02			SEMICON D DEVICE:SILICON,30V,150MA	07910	1N4152
CR874	152-0141-02			SEMICON D DEVICE:SILICON,30V,150MA	07910	1N4152
CR888	152-0141-02			SEMICON D DEVICE:SILICON,30V,150MA	07910	1N4152
CR890	152-0141-02			SEMICON D DEVICE:SILICON,30V,150MA	07910	1N4152
CR902	152-0141-02			SEMICON D DEVICE:SILICON,30V,150MA	07910	1N4152
CR910	152-0141-02			SEMICON D DEVICE:SILICON,30V,150MA	07910	1N4152
CR912	152-0141-02			SEMICON D DEVICE:SILICON,30V,150MA	07910	1N4152
CR950	152-0141-02			SEMICON D DEVICE:SILICON,30V,150MA	07910	1N4152
CR952	152-0141-02			SEMICON D DEVICE:SILICON,30V,150MA	07910	1N4152
CR954	152-0141-02			SEMICON D DEVICE:SILICON,30V,150MA	07910	1N4152
CR956	152-0141-02			SEMICON D DEVICE:SILICON,30V,150MA	07910	1N4152
CR960	152-0141-02			SEMICON D DEVICE:SILICON,30V,150MA	07910	1N4152
CR962	152-0141-02			SEMICON D DEVICE:SILICON,30V,150MA	07910	1N4152
CR972	152-0141-02			SEMICON D DEVICE:SILICON,30V,150MA	07910	1N4152
CR973	152-0141-02			SEMICON D DEVICE:SILICON,30V,150MA	07910	1N4152
CR975	152-0141-02			SEMICON D DEVICE:SILICON,30V,150MA	07910	1N4152
CR982	152-0141-02			SEMICON D DEVICE:SILICON,30V,150MA	07910	1N4152
CR984	152-0141-02			SEMICON D DEVICE:SILICON,30V,150MA	07910	1N4152
CR986	152-0141-02			SEMICON D DEVICE:SILICON,30V,150MA	07910	1N4152
CR996	152-0107-00			SEMICON D DEVICE:SILICON,375V,400MA	80009	152-0107-00
CR998	152-0107-00			SEMICON D DEVICE:SILICON,375V,400MA	80009	152-0107-00
CR1000	152-0141-02			SEMICON D DEVICE:SILICON,30V,150MA	07910	1N4152
CR1016	152-0141-02			SEMICON D DEVICE:SILICON,30V,150MA	07910	1N4152
CR1018	152-0141-02			SEMICON D DEVICE:SILICON,30V,150MA	07910	1N4152
DS182	150-0111-00			LAMP,GLOW:NEON,1.2MA	08806	2AC-AT
DS183	150-0111-00			LAMP,GLOW:NEON,1.2MA	08806	2AC-AT
F10	159-0040-00			FUSE,CARTRIDGE:3AG,0.7A,SLOW-BLOW	71400	MDL 7/10
F120	159-0021-00			FUSE,CARTRIDGE:3AG,2A,250V,FAST-BLOW	71400	AGC 2
J20	131-0569-00			CONNECTOR,RCPT,:25 PIN,FEMALE	71468	DB25S
J200	131-0955-00			CONNECTOR,RCPT,:BNC,FEMALE	24931	28JR200-1
J300	131-0955-00			CONNECTOR,RCPT,:BNC,FEMALE	24931	28JR200-1
J400	131-0955-00			CONNECTOR,RCPT,:BNC,FEMALE	24931	28JR200-1
J500	131-0955-00			CONNECTOR,RCPT,:BNC,FEMALE	24931	28JR200-1
J600	131-0955-00			CONNECTOR,RCPT,:BNC,FEMALE	24931	28JR200-1
J650	131-0955-00			CONNECTOR,RCPT,:BNC,FEMALE	24931	28JR200-1
L145	108-0792-00			COIL,TUBE DEFLE:TRACE ROTATION	80009	108-0792-00
L154	108-0324-00			COIL,RF:10MH	76493	70F102A1
L158	108-0324-00			COIL,RF:10MH	76493	70F102A1
L172	108-0714-00			COIL,TUBE DEFLE:Y AXIS ALIGNMENT	80009	108-0714-00
Q30	151-0405-00			TRANSISTOR:SILICON,NPN,SEL FROM MJE800	80009	151-0405-00
Q32	151-0188-00			TRANSISTOR:SILICON,PNP	01295	2N3906
Q50	151-0190-00			TRANSISTOR:SILICON,NPN	80009	151-0190-00
Q60	151-0405-00			TRANSISTOR:SILICON,NPN,SEL FROM MJE800	80009	151-0405-00
Q64	151-0190-00			TRANSISTOR:SILICON,NPN	80009	151-0190-00
Q70	151-0405-00			TRANSISTOR:SILICON,NPN,SEL FROM MJE800	80009	151-0405-00
Q76	151-0190-00			TRANSISTOR:SILICON,NPN	80009	151-0190-00
Q80	151-0190-00			TRANSISTOR:SILICON,NPN	80009	151-0190-00
Q120	151-0302-00			TRANSISTOR:SILICON,NPN	04713	2N2222A
Q130	151-0349-00			TRANSISTOR:SILICON,NPN,SEL FROM MJE2801	04713	SJE924

Ckt No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Name & Description	Mfr Code	Mfr Part Number
Q132	151-0103-00		TRANSISTOR:SILICON,NPN	04713	2N2219A
Q210A,B	151-1054-00		TRANSISTOR:SILICON,JFE,N-CHANNEL,DUAL	80009	151-1054-00
Q220	151-0188-00		TRANSISTOR:SILICON,PNP	01295	2N3906
Q230	151-0188-00		TRANSISTOR:SILICON,PNP	01295	2N3906
Q232	151-0188-00		TRANSISTOR:SILICON,PNP	01295	2N3906
Q260	151-0188-00		TRANSISTOR:SILICON,PNP	01295	2N3906
Q264	151-0279-00		TRANSISTOR:SILICON,NPN	80009	151-0279-00
Q320	151-0188-00		TRANSISTOR:SILICON,PNP	01295	2N3906
Q330	151-0188-00		TRANSISTOR:SILICON,PNP	01295	2N3906
Q332	151-0188-00		TRANSISTOR:SILICON,PNP	01295	2N3906
Q360	151-0188-00		TRANSISTOR:SILICON,PNP	01295	2N3906
Q364	151-0279-00		TRANSISTOR:SILICON,NPN	80009	151-0279-00
Q410A,B	151-1054-00		TRANSISTOR:SILICON,JFE,N-CHANNEL,DUAL	80009	151-1054-00
Q420	151-0188-00		TRANSISTOR:SILICON,PNP	01295	2N3906
Q430	151-0188-00		TRANSISTOR:SILICON,PNP	01295	2N3906
Q432	151-0188-00		TRANSISTOR:SILICON,PNP	01295	2N3906
Q460	151-0188-00		TRANSISTOR:SILICON,PNP	01295	2N3906
Q464	151-0190-00		TRANSISTOR:SILICON,NPN	80009	151-0190-00
Q520	151-0188-00		TRANSISTOR:SILICON,PNP	01295	2N3906
Q530	151-0188-00		TRANSISTOR:SILICON,PNP	01295	2N3906
Q532	151-0188-00		TRANSISTOR:SILICON,PNP	01295	2N3906
Q560	151-0188-00		TRANSISTOR:SILICON,PNP	01295	2N3906
Q564	151-0190-00		TRANSISTOR:SILICON,NPN	80009	151-0190-00
Q610A,B	151-1054-00		TRANSISTOR:SILICON,JFE,N-CHANNEL,DUAL	80009	151-1054-00
Q620	151-0188-00		TRANSISTOR:SILICON,PNP	01295	2N3906
Q630	151-0188-00		TRANSISTOR:SILICON,PNP	01295	2N3906
Q640	151-0188-00		TRANSISTOR:SILICON,PNP	01295	2N3906
Q670	151-0188-00		TRANSISTOR:SILICON,PNP	01295	2N3906
Q680	151-0188-00		TRANSISTOR:SILICON,PNP	01295	2N3906
Q690	151-0190-00		TRANSISTOR:SILICON,NPN	80009	151-0190-00
Q700	151-0190-00		TRANSISTOR:SILICON,NPN	80009	151-0190-00
Q710	151-0190-00		TRANSISTOR:SILICON,NPN	80009	151-0190-00
Q720	151-0279-00		TRANSISTOR:SILICON,NPN	80009	151-0279-00
Q724	151-0270-00		TRANSISTOR:SILICON,PNP,SEL FROM 2N3495	80009	151-0270-00
Q810	151-0190-00		TRANSISTOR:SILICON,NPN	80009	151-0190-00
Q835	151-0126-00		TRANSISTOR:SILICON,NPN	15818	2N2484
Q872	151-0188-00		TRANSISTOR:SILICON,PNP	01295	2N3906
Q876	151-0190-00		TRANSISTOR:SILICON,NPN	80009	151-0190-00
Q990	151-0190-00		TRANSISTOR:SILICON,NPN	80009	151-0190-00
Q996	151-0292-00		TRANSISTOR:SILICON,NPN	01295	TIS100
Q1010	151-0292-00		TRANSISTOR:SILICON,NPN	01295	TIS100
Q1026	151-0190-00		TRANSISTOR:SILICON,NPN	80009	151-0190-00
Q1036	151-0292-00		TRANSISTOR:SILICON,NPN	01295	TIS100
Q1050	151-0292-00		TRANSISTOR:SILICON,NPN	01295	TIS100
Q1060	151-0216-00		TRANSISTOR:SILICON,PNP	04713	MPS6523
Q1066	151-0292-00		TRANSISTOR:SILICON,NPN	01295	TIS100
R25	315-0221-00		RES.,FXD,CMPSN:220 OHM,5%,0.25W	01121	CB2215
R27	315-0221-00		RES.,FXD,CMPSN:220 OHM,5%,0.25W	01121	CB2215
R30	315-0333-00		RES.,FXD,CMPSN:33K OHM,5%,0.25W	01121	CB3335
R31	315-0472-00		RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
R34	308-0568-00		RES.,FXD,WW:0.33 OHM,5%,5W	91637	RS5-K35R00J
R36	308-0702-00		RES.,FXD,WW:1.8 OHM,5%,2W	75042	8WH-R3306J

Replaceable Electrical Parts—607

Ckt No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Name & Description	Mfr Code	Mfr Part Number
R38	321-0250-00		RES.,FXD,FILM:3.92K OHM,1%,0.125W	75042	CEATO-3921F
R40	311-1564-00		RES.,VAR,NONWIR:500 OHM,20%,0.50W	73138	91A-500ROM
R42	321-0242-00		RES.,FXD,FILM:3.24K OHM,1%,0.125W	75042	CEATO-3241F
R44	315-0334-00		RES.,FXD,CMPSN:330K OHM,5%,0.25W	01121	CB3345
R46	315-0561-00		RES.,FXD,CMPSN:560 OHM,5%,0.25W	01121	CB5615
R48	315-0101-00		RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R50	315-0202-00		RES.,FXD,CMPSN:2K OHM,5%,0.25W	01121	CB2025
R54	315-0822-00		RES.,FXD,CMPSN:8.2K OHM,5%,0.25W	01121	CB8225
R56	305-0620-00		RES.,FXD,CMPSN:62 OHM,5%,2W	01121	HB6205
R58	315-0152-00		RES.,FXD,CMPSN:1.5K OHM,5%,0.25W	01121	CB1525
R60	321-0254-00		RES.,FXD,FILM:4.32K OHM,1%,0.125W	75042	CEATO-4321F
R62	321-0335-00		RES.,FXD,FILM:30.1K OHM,1%,0.125W	75042	CEATO-3012F
R64	315-0101-00		RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R70	308-0218-00		RES.,FXD,WW:150 OHM,5%,3W	91637	RS2B-150R0J
R72	308-0764-00		RES.,FXD,WW:2.7 OHM,5%,2W	75042	BWF2R70F
R74	315-0101-00		RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R76	315-0823-00		RES.,FXD,CMPSN:82K OHM,5%,0.25W	01121	CB8235
R78	315-0331-00		RES.,FXD,CMPSN:330 OHM,5%,0.25W	01121	CB3315
R80	315-0334-00		RES.,FXD,CMPSN:330K OHM,5%,0.25W	01121	CB3345
R82	315-0183-00		RES.,FXD,CMPSN:18K OHM,5%,0.25W	01121	CB1835
R84	315-0101-00		RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R86	321-0306-00		RES.,FXD,FILM:15K OHM,1%,0.125W	75042	CEATO-1502F
R88	321-0335-00		RES.,FXD,FILM:30.1K OHM,1%,0.125W	75042	CEATO-3012F
R100	311-1555-00		RES.,VAR,NONWIR:100K OHM,20%,0.5W	73138	91A-10002M
R102	321-0473-00		RES.,FXD,FILM:825K OHM,1%,0.125W	75042	CEATO-8253F
R104A-D	307-0290-06		RES.,FXD,FILM:HIGH VOLTAGE DIV	80009	3070-0290-06
R106	315-0123-00		RES.,FXD,CMPSN:12K OHM,5%,0.25W	01121	CB1235
R108	321-0360-00		RES.,FXD,FILM:54.9K OHM,1%,0.125W	75042	CEATO-5492F
R110	321-0258-00		RES.,FXD,FILM:4.75K OHM,1%,0.125W	75042	CEATO-4751F
R112	315-0821-00		RES.,FXD,CMPSN:820 OHM,5%,0.25W	01121	CB8215
R114	315-0104-00		RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
R116	315-0563-00		RES.,FXD,CMPSN:56K OHM,5%,0.25W	01121	CB5635
R118	315-0331-00		RES.,FXD,CMPSN:330 OHM,5%,0.25W	01121	CB3315
R120	315-0101-00		RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R124	315-0273-00		RES.,FXD,CMPSN:27K OHM,5%,0.25W	01121	CB2735
R126	315-0152-00		RES.,FXD,CMPSN:1.5K OHM,5%,0.25W	01121	CB1525
R128	308-0459-00		RES.,FXD,WW:1.1 OHM,5%,3W	91637	RS2B-D1R100J
R130	315-0271-00		RES.,FXD,CMPSN:270 OHM,5%,0.25W	01121	CB2715
R132	315-0391-00		RES.,FXD,CMPSN:390 OHM,5%,0.25W	01121	CB3915
R145	311-1332-00		RES.,VAR,NONWIR:5K OHM,10%,2W	80009	311-1332-00
R148	315-0103-00		RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R150	315-0564-00		RES.,FXD,CMPSN:560K OHM,5%,0.25W	01121	CB5645
R151	315-0154-00		RES.,FXD,CMPSN:150K OHM,5%,0.25W	01121	CB1545
R158	315-0180-00		RES.,FXD,CMPSN:18 OHM,5%,0.25W	01121	CB1805
R162	315-0622-00		RES.,FXD,CMPSN:6.2K OHM,5%,0.25W	01121	CB6225
R164	315-0822-00		RES.,FXD,CMPSN:8.2K OHM,5%,0.25W	01121	CB8225
R165	311-1555-00		RES.,VAR,NONWIR:100K OHM,20%,0.5W	73138	91A-10002M
R170	311-1556-00		RES.,VAR,NONWIR:50K OHM,20%,0.50W	73138	91A-50001M
R172	315-0122-00		RES.,FXD,CMPSN:1.2K OHM,5%,0.25W	01121	CB1225
R173	311-1561-00		RES.,VAR,NONWIR:2.5K OHM,20%,0.50W	73138	91A-25000M
R174	315-0122-00		RES.,FXD,CMPSN:1.2K OHM,5%,0.25W	01121	CB1225
R175A,B	311-1687-00		RES.,VAR,NONWIR:2K OHM X 5M OHM,20%,0.5W	01121	12M359
R180	315-0101-00		RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
R182	315-0106-00			RES.,FXD,CMPSN:10M OHM,5%,0.25W	01121	CB1065
R184	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R186	315-0471-00			RES.,FXD,CMPSN:470 OHM,5%,0.25W	01121	CB4715
R188	315-0221-00			RES.,FXD,CMPSN:220 OHM,5%,0.25W	01121	CB2215
R190	321-0373-00			RES.,FXD,FILM:75K OHM, 1%,0.125W	75042	CEAT0-7502F
R192	311-1555-00			RES.,VAR,NONWIR:100K OHM,20%,0.5W	73138	91A-10002M
R194	321-0373-00			RES.,FXD,FILM:75K OHM, 1%,0.125W	75042	CEAT0-7502F
R200	321-0891-00			RES.,FXD,FILM:800K OHM,1%,0.125W	75042	CEAT0-8003F
R202	321-0423-00			RES.,FXD,FILM:249K OHM,1%,0.125W	75042	CEAT0-2493F
R204	322-0481-00			RES.,FXD,FILM:1M OHM,1%,0.25W	75042	CEBT0-1004F
R206	321-0385-00			RES.,FXD,FILM:100K OHM,1%,0.125W	75042	CEAT0-1003F
R208	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R210	315-0822-00			RES.,FXD,CMPSN:8.2K OHM,5%,0.25W	01121	CB8225
R212	321-0207-00			RES.,FXD,FILM:1.4K OHM,1%,0.125W	75042	CEAT0-1401F
R215	311-1561-00			RES.,VAR,NONWIR:2.5K OHM,20%,0.50W	73138	91A-25000M
R216	315-0470-00			RES.,FXD,CMPSN:47 OHM,5%,0.25W	01121	CB4705
R218	321-0126-00			RES.,FXD,FILM:200 OHM,1%,0.125W	75042	CEAT0-2000F
R220	315-0751-00			RES.,FXD,CMPSN:750 OHM,5%,0.25W	01121	CB7515
R222	315-0752-00			RES.,FXD,CMPSN:7.5K OHM,5%,0.25W	01121	CB7525
R226	315-0153-00			RES.,FXD,CMPSN:15K OHM,5%,0.25W	01121	CB1535
R228	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R230	315-0822-00			RES.,FXD,CMPSN:8.2K OHM,5%,0.25W	01121	CB8225
R232	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R234	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R238	315-0392-00			RES.,FXD,CMPSN:3.9K OHM,5%,0.25W	01121	CB3925
R240	311-1311-00			RES.,VAR,NONWIR:1K OHM,20%,1W	01121	10M155A
R242	321-0289-00			RES.,FXD,FILM:10K OHM,1%,0.125W	75042	CEAT0-1002F
R246	315-0182-00			RES.,FXD,CMPSN:1.8K OHM,5%,0.25W	01121	CB1825
R250	321-0385-00			RES.,FXD,FILM:100K OHM,1%,0.125W	75042	CEAT0-1003F
R254	315-0752-00			RES.,FXD,CMPSN:7.5K OHM,5%,0.25W	01121	CB7525
R256	315-0821-00			RES.,FXD,CMPSN:820 OHM,5%,0.25W	01121	CB8215
R260	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R262	315-0471-00			RES.,FXD,CMPSN:470 OHM,5%,0.25W	01121	CB4715
R264	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R266	308-0349-00			RES.,FXD,WW:3.6K OHM,1%,3W	91637	RS2B-B36000F
R268	315-0240-00			RES.,FXD,CMPSN:24 OHM,5%,0.25W	01121	CB2405
R270	323-0154-00			RES.,FXD,FILM:392 OHM,1%,0.50W	75042	CECT0-3920F
R272	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R300	321-0891-00			RES.,FXD,FILM:800K OHM,1%,0.125W	75042	CEAT0-8003F
R302	321-0423-00			RES.,FXD,FILM:249K OHM,1%,0.125W	75042	CEAT0-2493F
R304	322-0481-00			RES.,FXD,FILM:1M OHM,1%,0.25W	75042	CEBT0-1004F
R306	321-0385-00			RES.,FXD,FILM:100K OHM,1%,0.125W	75042	CEAT0-1003F
R308	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R310	315-0822-00			RES.,FXD,CMPSN:8.2K OHM,5%,0.25W	01121	CB8225
R312	321-0207-00			RES.,FXD,FILM:1.4K OHM,1%,0.125W	75042	CEAT0-1401F
R322	315-0752-00			RES.,FXD,CMPSN:7.5K OHM,5%,0.25W	01121	CB7525
R326	315-0153-00			RES.,FXD,CMPSN:15K OHM,5%,0.25W	01121	CB1535
R328	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R330	315-0822-00			RES.,FXD,CMPSN:8.2K OHM,5%,0.25W	01121	CB8225
R332	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R334	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R350	321-0385-00			RES.,FXD,FILM:100K OHM,1%,0.125W	75042	CEAT0-1003F
R360	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035

Replaceable Electrical Parts—607

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Discont	Name & Description	Mfr Code	Mfr Part Number
R362	315-0471-00			RES.,FXD,CMPSN:470 OHM,5%,0.25W	01121	CB4715
R364	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R366	308-0349-00			RES.,FXD,WW:3.6K OHM,1%,3W	91637	RS2B-B36000F
R368	315-0240-00			RES.,FXD,CMPSN:24 OHM,5%,0.25W	01121	CB2405
R380	315-0183-00			RES.,FXD,CMPSN:18K OHM,5%,0.25W	01121	CB1835
R382	315-0392-00			RES.,FXD,CMPSN:3.9K OHM,5%,0.25W	01121	CB3925
R400	321-0891-00			RES.,FXD,FILM:800K OHM,1%,0.125W	75042	CEATO-8003F
R402	321-0423-00			RES.,FXD,FILM:249K OHM,1%,0.125W	75042	CEATO-2493F
R404	322-0481-00			RES.,FXD,FILM:1M OHM,1%,0.25W	75042	CEATO-1004F
R406	321-0385-00			RES.,FXD,FILM:100K OHM,1%,0.125W	75042	CEATO-1003F
R408	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R410	315-0822-00			RES.,FXD,CMPSN:8.2K OHM,5%,0.25W	01121	CB8225
R412	321-0207-00			RES.,FXD,FILM:1.4K OHM,1%,0.125W	75042	CEATO-1401F
R415	311-1561-00			RES.,VAR,NONWIR:2.5K OHM,20%,0.50W	73138	91A-25000M
R416	315-0470-00			RES.,FXD,CMPSN:47 OHM,5%,0.25W	01121	CB4705
R418	321-0126-00			RES.,FXD,FILM:200 OHM,1%,0.125W	75042	CEATO-2000F
R420	315-0751-00			RES.,FXD,CMPSN:750 OHM,5%,0.25W	01121	CB7515
R422	315-0752-00			RES.,FXD,CMPSN:7.5K OHM,5%,0.25W	01121	CB7525
R426	315-0153-00			RES.,FXD,CMPSN:15K OHM,5%,0.25W	01121	CB1535
R428	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R430	315-0153-00			RES.,FXD,CMPSN:15K OHM,5%,0.25W	01121	CB1535
R432	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R434	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R438	315-0512-00			RES.,FXD,CMPSN:5.1K OHM,5%,0.25W	01121	CB5125
R440	311-1311-00			RES.,VAR,NONWIR:1K OHM,20%,1W	01121	10M155A
R442	321-0311-00			RES.,FXD,FILM:16.9K OHM,1%,0.125W	75042	CEATO-1692F
R446	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
R450	321-0354-00			RES.,FXD,FILM:47.5K OHM,1%,0.125W	75042	CEATO-4752F
R454	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
R456	315-0391-00			RES.,FXD,CMPSN:390 OHM,5%,0.25W	01121	CB3915
R460	315-0912-00			RES.,FXD,CMPSN:9.1K OHM,5%,0.25W	01121	CB9125
R464	315-0271-00			RES.,FXD,CMPSN:270 OHM,5%,0.25W	01121	CB2715
R466	321-0247-00			RES.,FXD,FILM:3.65K OHM,1%,0.125W	75042	CEATO-3651F
R468	315-0430-00			RES.,FXD,CMPSN:43 OHM,5%,0.25W	01121	CB4305
R470	321-0196-00			RES.,FXD,FILM:1.07K OHM,1%,0.125W	75042	CEATO-1071F
R500	321-0891-00			RES.,FXD,FILM:800K OHM,1%,0.125W	75042	CEATO-8003F
R502	321-0423-00			RES.,FXD,FILM:249K OHM,1%,0.125W	75042	CEATO-2493F
R504	322-0481-00			RES.,FXD,FILM:1M OHM,1%,0.25W	75042	CEATO-1004F
R506	321-0385-00			RES.,FXD,FILM:100K OHM,1%,0.125W	75042	CEATO-1003F
R508	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R510	315-0822-00			RES.,FXD,CMPSN:8.2K OHM,5%,0.25W	01121	CB8225
R512	321-0207-00			RES.,FXD,FILM:1.4K OHM,1%,0.125W	75042	CEATO-1401F
R522	315-0752-00			RES.,FXD,CMPSN:7.5K OHM,5%,0.25W	01121	CB7525
R526	315-0153-00			RES.,FXD,CMPSN:15K OHM,5%,0.25W	01121	CB1535
R528	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R530	315-0153-00			RES.,FXD,CMPSN:15K OHM,5%,0.25W	01121	CB1535
R532	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R534	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R550	321-0354-00			RES.,FXD,FILM:47.5K OHM,1%,0.125W	75042	CEATO-4752F
R560	315-0912-00			RES.,FXD,CMPSN:9.1K OHM,5%,0.25W	01121	CB9125
R564	315-0271-00			RES.,FXD,CMPSN:270 OHM,5%,0.25W	01121	CB2715
R566	321-0247-00			RES.,FXD,FILM:3.65K OHM,1%,0.125W	75042	CEATO-3651F
R568	315-0430-00			RES.,FXD,CMPSN:43 OHM,5%,0.25W	01121	CB4305

Ckt No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Name & Description	Mfr Code	Mfr Part Number
R604	322-0481-00		RES.,FXD,FILM:1M OHM,1%,0.25W	75042	CEBT0-1004F
R606	315-0104-00		RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
R608	315-0102-00		RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R610	315-0682-00		RES.,FXD,CMPSN:6.8K OHM,5%,0.25W	01121	CB6825
R612	321-0210-00		RES.,FXD,FILM:1.5K OHM,1%,0.125W	75042	CEAT0-1501F
R614	321-0142-00		RES.,FXD,FILM:294 OHM,1%,0.125W	75042	CEAT0-2940F
R615	311-1561-00		RES.,VAR,NONWIR:2.5K OHM,20%,0.50W	73138	91A-25000M
R620	315-0751-00		RES.,FXD,CMPSN:750 OHM,5%,0.25W	01121	CB7515
R622	315-0183-00		RES.,FXD,CMPSN:18K OHM,5%,0.25W	01121	CB1835
R630	321-0198-00		RES.,FXD,FILM:1.13K OHM,1%,0.125W	75042	CEAT0-1131F
R632	321-0193-00		RES.,FXD,FILM:1K OHM,1%,0.125W	75042	CEAT0-1001F
R636	321-0158-00		RES.,FXD,FILM:432 OHM,1%,0.125W	75042	CEAT0-4320F
R640	321-0127-00		RES.,FXD,FILM:205 OHM,1%,0.125W	75042	CEAT0-2050F
R642	321-0208-00		RES.,FXD,FILM:1.43K OHM,1%,0.125W	75042	CEAT0-1431F
R644	321-0321-00		RES.,FXD,FILM:21.5K OHM,1%,0.125W	75042	CEAT0-2152F
R654	322-0481-00		RES.,FXD,FILM:1M OHM,1%,0.25W	75042	CEBT0-1004F
R656	315-0104-00		RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
R658	315-0102-00		RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R660	315-0682-00		RES.,FXD,CMPSN:6.8K OHM,5%,0.25W	01121	CB6825
R662	321-0210-00		RES.,FXD,FILM:1.5K OHM,1%,0.125W	75042	CEAT0-1501F
R672	315-0183-00		RES.,FXD,CMPSN:18K OHM,5%,0.25W	01121	CB1835
R680	321-0198-00		RES.,FXD,FILM:1.13K OHM,1%,0.125W	75042	CEAT0-1131F
R682	321-0193-00		RES.,FXD,FILM:1K OHM,1%,0.125W	75042	CEAT0-1001F
R690	315-0101-00		RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R692	321-0254-00		RES.,FXD,FILM:4.32K OHM,1%,0.125W	75042	CEAT0-4321F
R698	315-0392-00		RES.,FXD,CMPSN:3.9K OHM,5%,0.25W	01121	CB3925
R710	315-0101-00		RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R712	315-0472-00		RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
R716	315-0181-00		RES.,FXD,CMPSN:180 OHM,5%,0.25W	01121	CB1815
R724	301-0561-00		RES.,FXD,CMPSN:560 OHM,5%,0.50W	01121	EB5615
R726	315-0562-00		RES.,FXD,CMPSN:5.6K OHM,5%,0.25W	01121	CB5625
R728	315-0303-00		RES.,FXD,CMPSN:30K OHM,5%,0.25W	01121	CB3035
R730	315-0100-00		RES.,FXD,CMPSN:10 OHM,5%,0.25W	01121	CB1005
R734	322-0613-00		RES.,FXD,FILM:20.4K OHM,1%,0.25W	75042	CEBT0-2052F
R735	321-0253-00		RES.,FXD,FILM:4.22K OHM,1%,0.125W	75042	CEAT0-4221F
R750	301-0821-00		RES.,FXD,CMPSN:820 OHM,5%,0.50W	01121	EB8215
R802	315-0181-00		RES.,FXD,CMPSN:180 OHM,5%,0.25W	01121	CB1815
R806	315-0133-00		RES.,FXD,CMPSN:13K OHM,5%,0.25W	01121	CB1335
R808	315-0393-00		RES.,FXD,CMPSN:39K OHM,5%,0.25W	01121	CB3935
R810	315-0154-00		RES.,FXD,CMPSN:150K OHM,5%,0.25W	01121	CB1545
R812	315-0473-00		RES.,FXD,CMPSN:47K OHM,5%,0.25W	01121	CB4735
R814	315-0333-00		RES.,FXD,CMPSN:33K OHM,5%,0.25W	01121	CB3335
R816	315-0393-00		RES.,FXD,CMPSN:39K OHM,5%,0.25W	01121	CB3935
R820	315-0752-00		RES.,FXD,CMPSN:7.5K OHM,5%,0.25W	01121	CB7525
R822	315-0152-00		RES.,FXD,CMPSN:1.5K OHM,5%,0.25W	01121	CB1525
R824	315-0753-00		RES.,FXD,CMPSN:75K OHM,5%,0.25W	01121	CB7535
R828	315-0102-00		RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R830	315-0123-00		RES.,FXD,CMPSN:12K OHM,5%,0.25W	01121	CB1235
R834	321-0458-00		RES.,FXD,FILM:576K OHM,1%,0.125W	91637	MF1816G57602F
R835	311-1557-00		RES.,VAR,NONWIR:25K OHM,20%,0.50W	73138	91A-25001M
R838	315-0472-00		RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
R840	315-0154-00		RES.,FXD,CMPSN:150K OHM,5%,0.25W	01121	CB1545
R844	315-0471-00		RES.,FXD,CMPSN:470 OHM,5%,0.25W	01121	CB4715

Replaceable Electrical Parts—607

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr		
					Code	Mfr Part Number	
R846	315-0391-00			RES.,FXD,CMPSN:390 OHM,5%,0.25W	01121	CB3915	
R848	315-0163-00			RES.,FXD,CMPSN:16K OHM,5%,0.25W	01121	CB1635	
R852	315-0470-00			RES.,FXD,CMPSN:47 OHM,5%,0.25W	01121	CB4705	
R853	315-0222-00			RES.,FXD,CMPSN:2.2K OHM,5%,0.25W	01121	CB2225	
R856	315-0183-00			RES.,FXD,CMPSN:18K OHM,5%,0.25W	01121	CB1835	
R860	315-0181-00			RES.,FXD,CMPSN:180 OHM,5%,0.25W	01121	CB1815	
R862	315-0393-00			RES.,FXD,CMPSN:39K OHM,5%,0.25W	01121	CB3935	
R864	315-0393-00			RES.,FXD,CMPSN:39K OHM,5%,0.25W	01121	CB3935	
R866	315-0471-00			RES.,FXD,CMPSN:470 OHM,5%,0.25W	01121	CB4715	
R870	315-0153-00			RES.,FXD,CMPSN:15K OHM,5%,0.25W	01121	CB1535	
R872	315-0364-00			RES.,FXD,CMPSN:360K OHM,5%,0.25W	01121	CB3645	
R874	315-0153-00			RES.,FXD,CMPSN:15K OHM,5%,0.25W	01121	CB1535	
R875	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045	
R878	315-0562-00			RES.,FXD,CMPSN:5.6K OHM,5%,0.25W	01121	CB5625	
R880	315-0121-00			RES.,FXD,CMPSN:120 OHM,5%,0.25W	01121	CB1215	
R882	315-0221-00			RES.,FXD,CMPSN:220 OHM,5%,0.25W	01121	CB2215	
R886	315-0125-00			RES.,FXD,CMPSN:1.2M OHM,5%,0.25W	01121	CB1255	
R888	315-0106-00			RES.,FXD,CMPSN:10M OHM,5%,0.25W	01121	CB1065	
R890	315-0471-00			RES.,FXD,CMPSN:470 OHM,5%,0.25W	01121	CB4715	
R892	315-0301-00			RES.,FXD,CMPSN:300 OHM,5%,0.25W	01121	CB3015	
R894	315-0114-00			RES.,FXD,CMPSN:110K OHM,5%,0.25W	01121	CB1145	
R895 ¹	311-1688-00			RES.,VAR,NONWIR:50K OHM,20%,1W	01121	12M792	
R896	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025	
R897	315-0821-00			RES.,FXD,CMPSN:820 OHM,5%,0.25W	01121	CB8215	
R898	315-0473-00			RES.,FXD,CMPSN:47K OHM,5%,0.25W	01121	CB4735	
R902	315-0272-00			RES.,FXD,CMPSN:2.7K OHM,5%,0.25W	01121	CB2725	
R906	315-0393-00			RES.,FXD,CMPSN:39K OHM,5%,0.25W	01121	CB3935	
R908	315-0393-00			RES.,FXD,CMPSN:39K OHM,5%,0.25W	01121	CB3935	
R912	315-0181-00			RES.,FXD,CMPSN:180 OHM,5%,0.25W	01121	CB1815	
R950	321-0393-00			RES.,FXD,FILM:121K OHM,1%,0.125W	75042	CEATO-1213F	
R960	315-0152-00			RES.,FXD,CMPSN:1.5K OHM,5%,0.25W	01121	CB1525	
R962	315-0753-00			RES.,FXD,CMPSN:75K OHM,5%,0.25W	01121	CB7535	
R965	311-1555-00			RES.,VAR,NONWIR:100K OHM,20%,0.5W	73138	91A-10002M	
R966	321-0466-00			RES.,FXD,FILM:698K OHM,1%,0.125W	75042	CEATO-6983F	
R968	315-0106-00			RES.,FXD,CMPSN:10M OHM,5%,0.25W	01121	CB1065	
R970	311-1710-00			RES.,VAR,NONWIR:20K OHM,20%,1W	01121	12M565	
R972	315-0152-00			RES.,FXD,CMPSN:1.5K OHM,5%,0.25W	01121	CB1525	
R973	315-0753-00			RES.,FXD,CMPSN:75K OHM,5%,0.25W	01121	CB7535	
R975	311-1550-00			RES.,VAR,NONWIR:2M OHM,20%,0.50W	73138	91A-20003M	
R976	315-0335-00			RES.,FXD,CMPSN:3.3M OHM,5%,0.25W	01121	CB3355	
R982	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035	
R984	315-0153-00			RES.,FXD,CMPSN:15K OHM,5%,0.25W	01121	CB1535	
R986	315-0822-00			RES.,FXD,CMPSN:8.2K OHM,5%,0.25W	01121	CB8225	
R990	315-0272-00			RES.,FXD,CMPSN:2.7K OHM,5%,0.25W	01121	CB2725	
R992	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725	
R994	308-0503-00			RES.,FXD,WW:6.8 OHM,5%,2.50W	91637	RS2B-D6R800J	
R996	315-0272-00			RES.,FXD,CMPSN:2.7K OHM,5%,0.25W	01121	CB2725	
R998	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045	
R1000	315-0182-00			RES.,FXD,CMPSN:1.8K OHM,5%,0.25W	01121	CB1825	
R1010	303-0303-00			RES.,FXD,CMPSN:30K OHM,5%,1W	01121	GB3035	
R1012	315-0563-00			RES.,FXD,CMPSN:56K OHM,5%,0.25W	01121	CB5635	
R1014	315-0513-00			RES.,FXD,CMPSN:51K OHM,5%,0.25W	01121	CB5135	
R1016	315-0471-00			RES.,FXD,CMPSN:470 OHM,5%,0.25W	01121	CB4715	

¹ Furnished as a unit with S895A,B.

Ckt No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Name & Description	Mfr Code	Mfr Part Number
R1018	315-0123-00		RES.,FXD,CMPNS:12K OHM,5%,0.25W	01121	CB1235
R1026	315-0163-00		RES.,FXD,CMPNS:16K OHM,5%,0.25W	01121	CB1635
R1030	311-1556-00		RES.,VAR, NONWIR:50K OHM,20%,0.50W	73138	91A-50001M
R1032	315-0273-00		RES.,FXD,CMPNS:27K OHM,5%,0.25W	01121	CB2735
R1034	315-0223-00		RES.,FXD,CMPNS:22K OHM,5%,0.25W	01121	CB2235
R1036	305-0243-00		RES.,FXD,CMPNS:24K OHM,5%,2W	01121	HB2435
R1040	315-0223-00		RES.,FXD,CMPNS:22K OHM,5%,0.25W	01121	CB2235
R1042	311-1556-00		RES.,VAR, NONWIR:50K OHM,20%,0.50W	73138	91A-50001M
R1043	315-0433-00		RES.,FXD,CMPNS:43K OHM,5%,0.25W	01121	CB4335
R1046	315-0101-00		RES.,FXD,CMPNS:100 OHM,5%,0.25W	01121	CB1015
R1050	301-0333-00		RES.,FXD,CMPNS:33K OHM,5%,0.50W	01121	EB3335
R1052	315-0393-00		RES.,FXD,CMPNS:39K OHM,5%,0.25W	01121	CB3935
R1054	311-1556-00		RES.,VAR, NONWIR:50K OHM,20%,0.50W	73138	91A-50001M
R1055	315-0683-00		RES.,FXD,CMPNS:68K OHM,5%,0.25W	01121	CB6835
R1060	321-0423-00		RES.,FXD,FILM:249K OHM,1%,0.125W	75042	CEAT0-2493F
R1062	321-0481-00		RES.,FXD,FILM:1M OHM,1%,0.125W	75042	CEAT0-1004F
R1064	315-0683-00		RES.,FXD,CMPNS:68K OHM,5%,0.25W	01121	CB6835
R1066	303-0563-00		RES.,FXD,CMPNS:56K OHM,5%,1W	01121	GB5635
R1068	315-0101-00		RES.,FXD,CMPNS:100 OHM,5%,0.25W	01121	CB1015
S10	260-0413-00		SW,THERMOSTATIC:10A,240V	93410	110-361
S12	260-1222-00		SWITCH,PUSH-PUL:10A,250VAC	91929	2DM301
S895A,B ¹	311-1688-00		RES.,VAR, NONWIR:50K OHM,20%,1W	01121	12M792
S200	260-0723-00		SWITCH,SLIDE:DPDT,0.5A,125VAC	79727	GF126-0028
S300	260-0723-00		SWITCH,SLIDE:DPDT,0.5A,125VAC	79727	GF126-0028
S400	260-0723-00		SWITCH,SLIDE:DPDT,0.5A,125VAC	79727	GF126-0028
S500	260-0723-00		SWITCH,SLIDE:DPDT,0.5A,125VAC	79727	GF126-0028
S870	260-1308-00		SWITCH,PUSH:MOMENTARY	80009	260-1308-00
S910	260-1211-00		SWITCH,PUSH:DPDT,PUSH-PUSH	80009	260-1211-00
T15	120-0925-00		XFMR,PWR,STPDN:	80009	120-0925-00
T120	120-0926-00		XFMR,PWR,SDN/SU:	80009	120-0926-00
U110	156-0067-00		MICROCIRCUIT,LI:OPERATIONAL AMPLIFIER	80009	156-0067-00
U120	152-0660-00		SEMICOND DVC,DI:HV MULTIR,SI,7KV,IN,105KV OUT	52306	CMX286
U810	156-0057-00		MICROCIRCUIT,DI:QUAD 2-INPUT NAND GATE	07263	7401PC
U820	156-0072-00		MICROCIRCUIT,DI:MONOSTABLE MV,TTL	27014	DM74121N
U850	156-0072-00		MICROCIRCUIT,DI:MONOSTABLE MV,TTL	27014	DM74121N
U895	156-0072-00		MICROCIRCUIT,DI:MONOSTABLE MV,TTL	27014	DM74121N
V100 ²	154-0771-00		ELECTRON TUBE:CRT	80009	154-0771-00
V100	154-0771-01		ELECTRON TUBE:CRT	80009	154-0771-01
VR50	152-0166-00		SEMICOND DEVICE:ZENER,0.4W,6.2V,5%	81483	69-9035
VR130	152-0243-00		SEMICOND DEVICE:ZENER,0.4W,15V,5%	81483	1N965B
VR166	152-0268-00		SEMICOND DEVICE:ZENER,0.4W,56V,5%	04713	1N979B
VR270	152-0149-00		SEMICOND DEVICE:ZENER,0.4W,10V,5%	04713	1N961B
VR670	152-0149-00		SEMICOND DEVICE:ZENER,0.4W,10V,5%	04713	1N961B
VR690	152-0227-00		SEMICOND DEVICE:ZENER,0.4W,6.2V,5%	81483	69-6585
VR915	152-0166-00		SEMICOND DEVICE:ZENER,0.4W,6.2V,5%	81483	69-9035
VR1040	152-0428-00		SEMICOND DEVICE:ZENER,0.4W,120V,5%	04713	1N987B

¹Furnished as a unit with R895.

²Option 1 only.

Option 4

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A6	670-2278-00			CKT BOARD ASSY:SWEEP	80009	670-2278-00
C1105	281-0503-00			CAP.,FXD,CER DI:8PF,+/-0.5PF,500V	72982	301-000C0H0809D
C1110	290-0534-00			CAP.,FXD,ELCTLT:1UF,20%,35V	56289	196D105X0035HA1
C1112	281-0629-00			CAP.,FXD,CER DI:33PF,5%,600V	72982	308-000C0G0330J
C1114	283-0004-00			CAP.,FXD,CER DI:0.02UF,+80-20%,150V	72982	855-547E203Z
C1124	283-0041-00			CAP.,FXD,CER DI:0.0033UF,5%,500V	72982	841-541B332J
C1125	290-0534-00			CAP.,FXD,ELCTLT:1UF,20%,35V	56289	196D105X0035HA1
C1130	285-0754-02 ¹			CAP.,FXD,PLASTIC:0.001UF,3%,400V	80009	285-0754-02
C1134	285-0753-01 ¹			CAP.,FXD,PLASTIC:0.01UF,3%,100V	80009	285-0753-01
C1138	285-0895-00 ¹			CAP.,FXD,PLASTIC:1.0UF,3%,25V	80009	285-0895-00
C1160	281-0604-00			CAP.,FXD,CER DI:2.2PF,+/-0.25PF,500V	72982	301-000C0J0229C
C1162	290-0572-00			CAP.,FXD,ELCTLT:0.1UF,20%,50V	56289	196D104X0050HA1
C1176	281-0549-00			CAP.,FXD,CER DI:68PF,10%,500V	72982	301-000U2J0680K
C1190	290-0534-00			CAP.,FXD,ELCTLT:1UF,20%,35V	56289	196D105X0035HA1
C1194	290-0534-00			CAP.,FXD,ELCTLT:1UF,20%,35V	56289	196D105X0035HA1
C1195	290-0572-00			CAP.,FXD,ELCTLT:0.1UF,20%,50V	56289	196D104X0050HA1
CR1130	152-0141-02			SEMICONV DEVICE:SILICON,30V,150MA	07910	1N4152
CR1175	152-0141-02			SEMICONV DEVICE:SILICON,30V,150MA	07910	1N4152
Q1160	151-0342-00			TRANSISTOR:SILICON,PNP	07263	2N4249
Q1164	151-0341-00			TRANSISTOR:SILICON,NPN	07263	2N3565
Q1175	151-0342-00			TRANSISTOR:SILICON,PNP	07263	2N4249
Q1178	151-0190-00			TRANSISTOR:SILICON,NPN	80009	151-0190-00
R1105	315-0363-00			RES.,FXD,CMPSN:36K OHM,5%,0.25W	01121	CB3635
R1106	315-0223-00			RES.,FXD,CMPSN:22K OHM,5%,0.25W	01121	CB2235
R1110	316-0332-00			RES.,FXD,CMPSN:3.3K OHM,10%,0.25W	01121	CB3321
R1115	311-0607-00			RES.,VAR,NONWIR:10K OHM,10%,0.50W	80740	62-59-3
R1118	311-0949-00			RES.,VAR,NONWIR:2K OHM,10%,0.50W	01121	WALG040S202UA
R1120	316-0333-00			RES.,FXD,CMPSN:33K OHM,10%,0.25W	01121	CB3331
R1122	316-0122-00			RES.,FXD,CMPSN:1.2K OHM,10%,0.25W	01121	CB1221
R1124	315-0223-00			RES.,FXD,CMPSN:22K OHM,5%,0.25W	01121	CB2235
R1130	321-0356-00			RES.,FXD,FILM:49.9K OHM,1%,0.125W	75042	CEAT0-4992F
R1134	321-0452-00			RES.,FXD,FILM:499K OHM,1%,0.125W	75042	CEAT0-4993F
R1138	307-0381-00			RES.,FXD,FILM:4.99M OHM,1%,0.50W	03888	FL12-499734
R1145	311-0443-00			RES.,VAR,NONWIR:2500 OHM,20%,0.75W	11237	41330
R1146	315-0221-00			RES.,FXD,CMPSN:220 OHM,5%,0.25W	01121	CB2215
R1150	321-0327-00			RES.,FXD,FILM:24.9K OHM,1%,0.125W	75042	CEAT0-2492F
R1152	321-0311-00			RES.,FXD,FILM:16.9K OHM,1%,0.125W	75042	CEAT0-1692F
R1155	321-0369-00			RES.,FXD,FILM:68.1K OHM,1%,0.125W	75042	CEAT0-6812F
R1156	315-0822-00			RES.,FXD,CMPSN:8.2K OHM,5%,0.25W	01121	CB8225
R1158	316-0222-00			RES.,FXD,CMPSN:2.2K OHM,10%,0.25W	01121	CB2221
R1160	316-0333-00			RES.,FXD,CMPSN:33K OHM,10%,0.25W	01121	CB3331
R1162	316-0101-00			RES.,FXD,CMPSN:100 OHM,10%,0.25W	01121	CB1011
R1165	311-0635-00			RES.,VAR,NONWIR:1K OHM,10%,0.50W	80740	62-56-3
R1167	321-0230-00			RES.,FXD,FILM:2.43K OHM,1%,0.125W	75042	CEAT0-2431F
R1171	315-0273-00			RES.,FXD,CMPSN:27K OHM,5%,0.25W	01121	CB2735
R1173	316-0102-00			RES.,FXD,CMPSN:1K OHM,10%,0.25W	01121	CB1021
R1175	316-0102-00			RES.,FXD,CMPSN:1K OHM,10%,0.25W	01121	CB1021
R1176	316-0471-00			RES.,FXD,CMPSN:470 OHM,10%,0.25W	01121	CB4711
R1178	315-0133-00			RES.,FXD,CMPSN:13K OHM,5%,0.25W	01121	CB1335
R1190	301-0241-00			RES.,FXD,CMPSN:240 OHM,5%,0.50W	01121	EB2415

¹Available as a matched set, part number 295-0159-00. The letter suffix and the tolerance should be the same for all of the capacitors in the assembly.

Option 4

Ckt No.	Tektronix Part No.	Serial/Model No.		Name & Description	Mfr	
		Eff	Dscont		Code	Mfr Part Number
R1194	303-0821-00			RES.,FXD,CMPSN:820 OHM,5%,1W	01121	GB8215
S220	260-0723-00			SWITCH,SLIDE:DPDT,0.5A,125VAC	79727	GF126-0028
S735	260-0723-00			SWITCH,SLIDE:DPDT,0.5A,125VAC	79727	GF126-0028
S1109	260-0960-01			SWITCH,SLIDE:0.5A,120VDC,CKT BD MT	10389	23-021-043
S1130	105-0389-00			ACTR ASSY,CAM S:	80009	105-0389-00
U1130	155-0055-00			MICROCIRCUIT,LI:MONOLITHIC,TRIG AND SWEEP	80009	155-0055-00
VR1162	152-0166-00			SEMICOND DEVICE:ZENER,0.4W,6.2V,5%	81483	69-9035
VR1190	152-0217-00			SEMICOND DEVICE:ZENER,0.4W,8.2V,5%	07910	1N756A
VR1194	152-0217-00			SEMICOND DEVICE:ZENER,0.4W,8.2V,5%	07910	1N756A

INSTRUMENT OPTIONS

Your instrument may be equipped with one or more instrument options. A brief description of each available option is given in the following discussion. Option information is incorporated into the appropriate sections of the manual. Refer to Table 8-1 and the Table of Contents for location of option information. For further information on instrument options, see your Tektronix Catalog or contact your Tektronix Field Office.

OPTION 1

Includes an internal, unlighted, 8 X 10 division (0.9 cm/div) graticule.

OPTION 3

Deletes the carrying handle and feet.

OPTION 4

Includes an internal X-axis sweep with rates from 1 second/division to 1 microsecond/division. Instrument is internally selectable for X-Y or Y-T modes of operation.

OPTION 6

The standard 607 has been modified to meet Underwriter's Laboratory 544 Medical and Dental Equipment requirements. The modifications include warnings required for medical equipment, a hospital grade cord and plug cap, and an internal line fuse.

OPTION 7

Deletes all protective cabinet panels, the feet, and handle.

TABLE 8-1
Option Information Locator

Instrument Option	Manual Section	Location of Information
Option 1 (Crt with internal graticule)	7 Replaceable Electrical Parts	Provides the replacement part number for the crt with an internal graticule.
	8 Instrument Options	Option 1 The introduction includes a description of the Option 1 instrument.
Option 3 (Deletes carrying handle and feet)	8 Instrument Options	Option 3 The introduction includes a description of the Option 3 instrument.
	10 Replaceable Mechanical Parts	Provides a footnote deleting the carrying handle and feet for the Option 3 instrument.
Option 4 (Provides internal horizontal sweep circuit)	1 Specification	Electrical Table 1-2 includes electrical characteristics for the Option 4 instrument.
	2 Operating Instructions	Controls and Connectors Describes the function of the Option 4 front-panel controls.
		Functional Check Provides functional check procedure for the Option 4 instrument.
		Option 4 Sweep Information Discusses the use of the graticule, controls, and the internal sweep generator for making accurate time measurements.
	3 Installation	Connecting the Internal Sweep (Option 4) Provides a procedure for using the internal switches to connect the internal sweep generator.
	4 Theory of Operation	Detailed Circuit Operation Discusses the operation of the internal sweep circuit.
	6 Performance Check and Adjustment	Sweep Generator (Option 4) Contains procedures for checking and adjusting the Option 4 instrument.

TABLE 8-1 (CONT.)
Option Information Locator

Instrument Option	Manual Section	Location of Information
Option 4 (cont.)	7 Replaceable Electrical Parts	Provides an electrical parts list for the Option 4 instrument.
	8 Instrument Options	Option 4 The introduction includes a description of the Option 4 instrument.
	9 Diagrams and Circuit Board Illustrations	Provides block diagram, component, adjustment, test point, internal control and selector locations, troubleshooting chart, and schematic diagram for the Option 4 instrument.
	10 Replaceable Mechanical Parts	Provides a mechanical parts list and an exploded-view drawing for the Option 4 instrument.
Option 6 (Meets Underwriter's Laboratory 544 Medical and Dental Equipment requirements)	3 Installation	Line-Voltage and Regulating Range Selection Figure 3-1 shows the location of the line fuse for the Option 6 instrument.
	7 Replaceable Electrical Parts	Provides an electrical parts list with replacement parts footnoted for the Option 6 instrument.
	8 Instrument Options	Option 6 The introduction includes a description of the Option 6 instrument.
	10 Replaceable Mechanical Parts	Provides a mechanical parts list with replacement parts footnoted for the Option 6 instrument.
Option 7 (Deletes all protective cabinet panels, feet, and carrying handle)	8 Instrument Options	Option 7 The introduction includes a description of the Option 7 instrument.
	10 Replaceable Mechanical Parts	Provides a footnote deleting all the protective cabinet panels, feet, and carrying handle.

DIAGRAMS AND CIRCUIT BOARD ILLUSTRATIONS

Symbols and Reference Designators

Electrical components shown on the diagrams are in the following units unless noted otherwise:

Capacitors = Values one or greater are in picofarads (pF).
 Values less than one are in microfarads (μF).
 Resistors = Ohms (Ω).

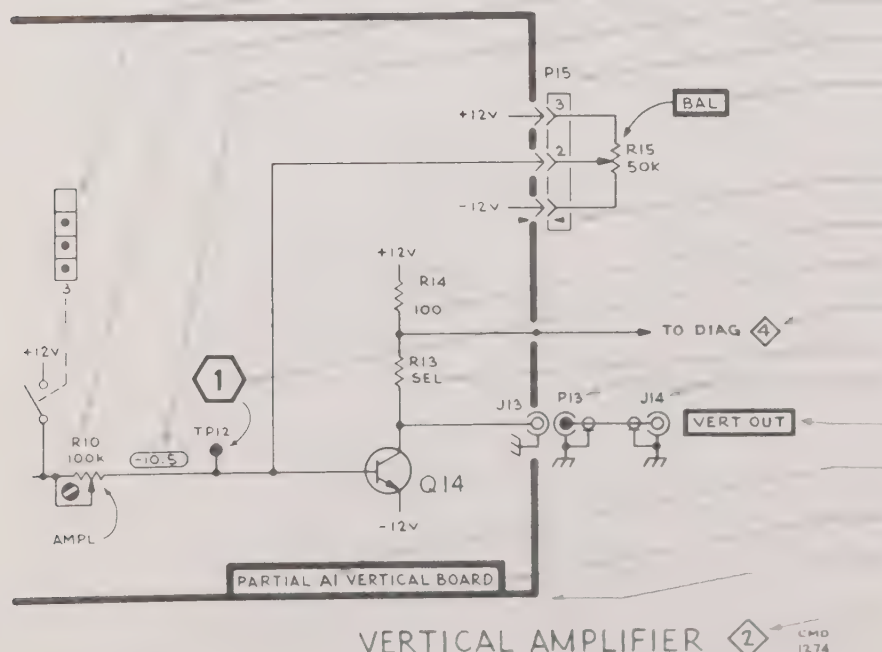
Symbols used on the diagrams are based on ANSI Standard Y32.2-1975.

Logic symbology is based on ANSI Y32.14-1973 in terms of positive logic. Logic symbols depict the logic function performed and may differ from the manufacturer's data.

The following prefix letters are used as reference designators to identify components or assemblies on the diagrams.

A	Assembly, separable or repairable (circuit board, etc.)	H	Heat dissipating device (heat sink, heat radiator, etc.)	RT	Thermistor
AT	Attenuator, fixed or variable	HR	Heater	S	Switch
B	Motor	HY	Hybrid circuit	T	Transformer
BT	Battery	J	Connector, stationary portion	TC	Thermocouple
C	Capacitor, fixed or variable	K	Relay	TP	Test point
CB	Circuit breaker	L	Inductor, fixed or variable	U	Assembly, inseparable or non-repairable (integrated circuit, etc.)
CR	Diode, signal or rectifier	LR	Inductor/resistor combination	V	Electron tube
DL	Delay line	M	Meter	VR	Voltage regulator (zener diode, etc.)
DS	Indicating device (lamp)	P	Connector, movable portion	Y	Crystal
E	Spark Gap	Q	Transistor or silicon-controlled rectifier	Z	Phase shifter
F	Fuse	R	Resistor, fixed or variable		
FL	Filter				

The following special symbols are used on the diagrams:



Cam Switch Closure Chart

Internal Screwdriver Adjustment

Test Voltage

Plug to E.C. Board

Panel Adjustment

Plug Index

Modified Component—See Parts List

Refer to Waveform

Refer to Diagram Number

SEL Value Selected at Factory

Coaxial Connector

Panel Connector

Assembly Number

Board Name

Etched Circuit Board Outlined in Black

Schematic Name and Number

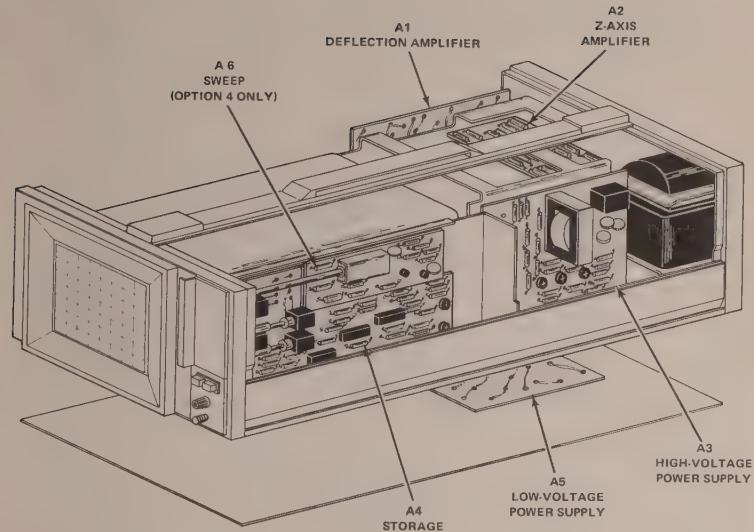
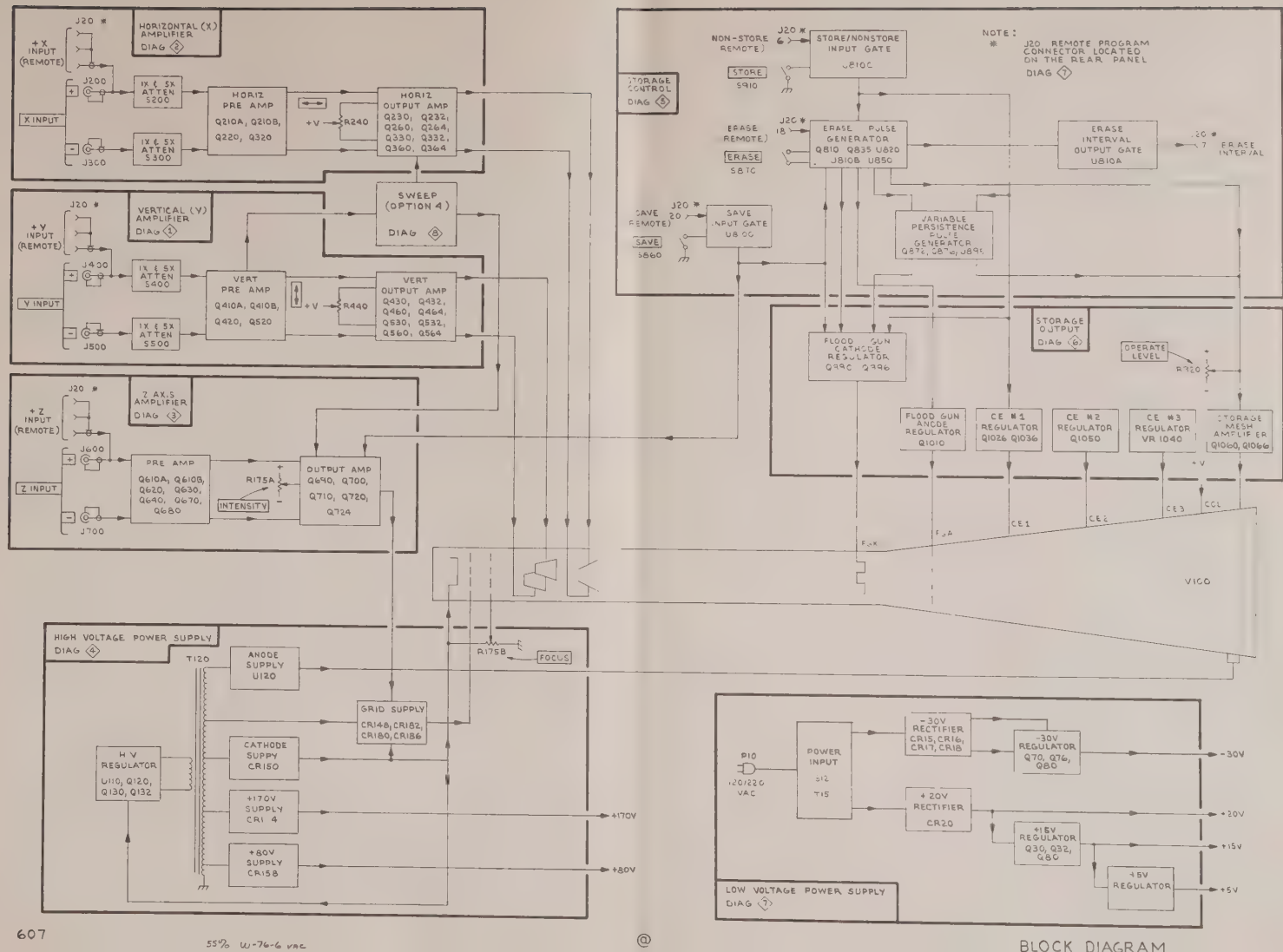


Figure 9-1. Circuit board locations.

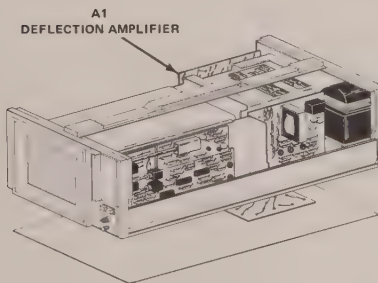
2091-24





2091-26

INDEX FOR FIG.9-2



VOLTAGE AND WAVEFORM CONDITIONS

NOTE

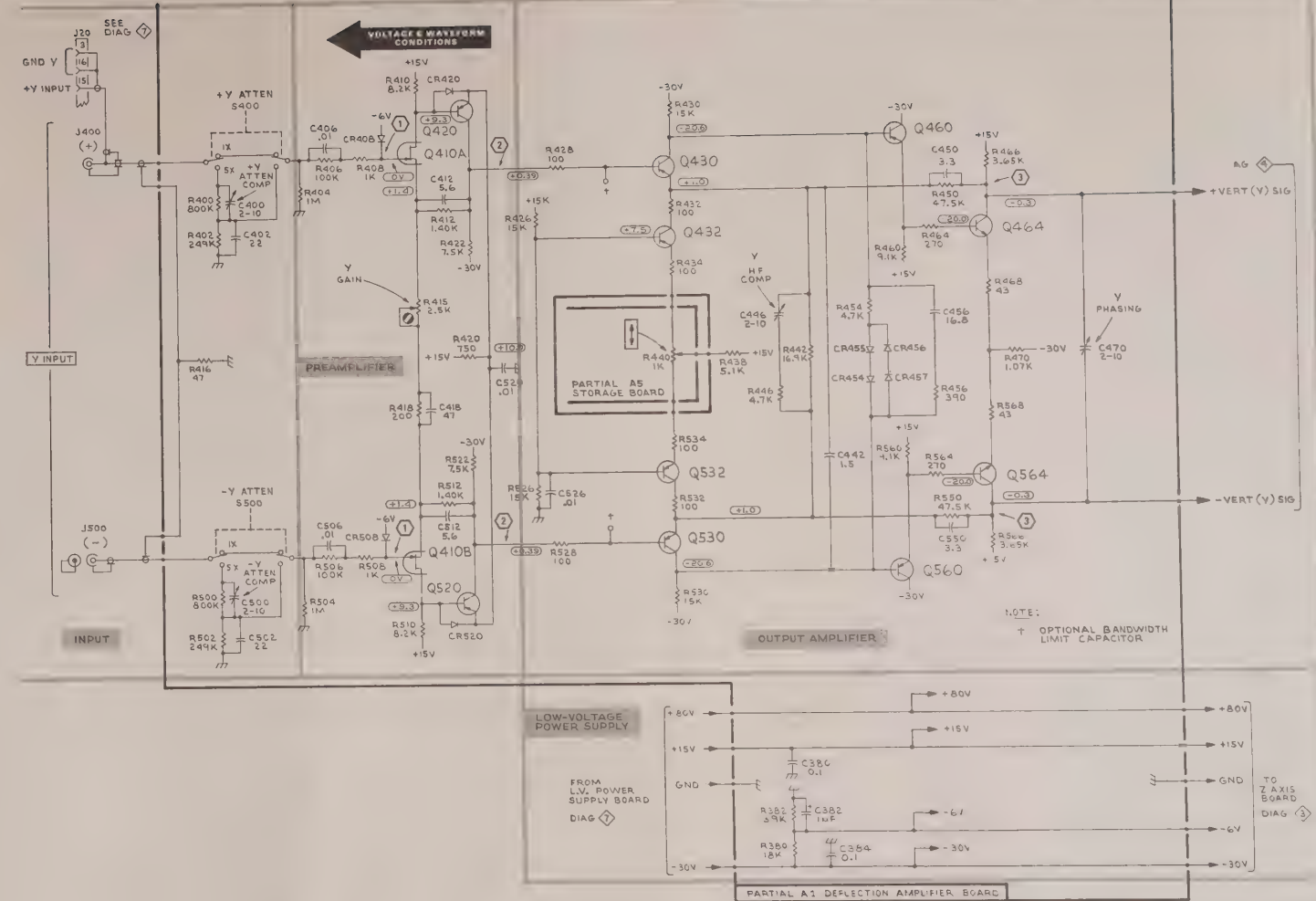
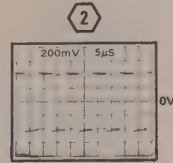
The test equipment used to obtain the voltages and waveforms is listed in Table 6-1, Test Equipment.

VOLTAGE CONDITIONS

The dc voltages indicated on the schematic diagram were obtained with no test signal input using a digital multimeter. The INTENSITY and Position controls were set for a barely visible dot at near center screen with the internal sweep generator disconnected (Option 4 version only).

WAVEFORM CONDITIONS

The following waveforms were monitored with a test oscilloscope and a 10X probe. A negative-going 100 kHz, 0.5 V, square wave was applied to the appropriate input connector with the vertical Position control centered, Y Atten switches at 1X, internal sweep generator disconnected (Option 4 version only), and the unused input connector grounded (grounding cap installed). The test points shown on the component and waveform test point location illustration with a + or - sign opposite the test point number indicates the input connector to which the test signal was applied.



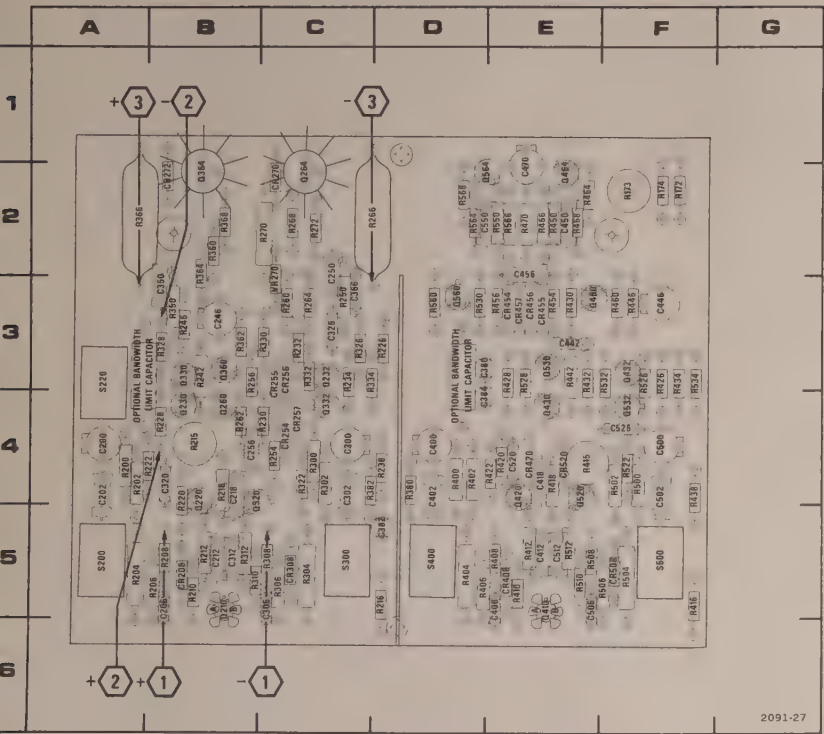
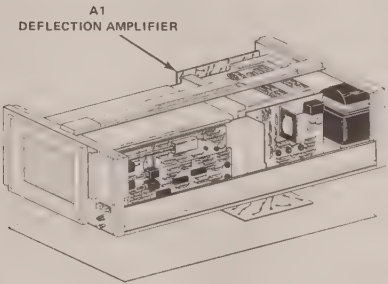


Figure 9-3. A1—Horizontal Amplifier component and waveform test point locations.

CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD
C200	4A	C506	5E	Q330	3B	R226	3D	R350	3B	R460	3F
C202	4A	C512	5E	Q332	4C	R228	4E	R360	2B	R464	2E
C206	5B	C520	4E	Q360	3B	R230	4C	R362	3B	R466	2E
C212	5B	C526	4F	Q364	2B	R232	3C	R364	2B	R468	2E
C218	4B	C550	2D	Q410	5E	R234	3C	R366	2A	R470	2E
C246	3B			Q420	4E	R238	4D	R368	2B	R500	4F
C250	2C	CR208	5B	Q430	4E	R242	3B	R380	4D	R502	4F
C256	4B	CR254	4C	Q432	3F	R246	3B	R382	4C	R504	5F
C300	4C	CR255	3C	Q460	3E	R250	3C	R400	4D	R506	5F
C302	4C	CR256	3C	Q464	2E	R254	4C	R402	4D	R508	5E
C306	5C	CR257	4C	Q520	4E	R256	3B	R404	5D	R510	5E
C312	5B	CR270	2C	Q530	3E	R260	3C	R406	5D	R512	5E
C320	4B	CR272	2B	Q532	4F	R262	4B	R408	5E	R522	4F
C326	3C	CR308	5C	Q560	3D	R264	3C	R410	5E	R526	3F
C350	3B	CR408	5E	Q564	2D	R266	2C	R412	5E	R530	3D
C366	3C	CR420	4E			R268	2C	R415	4E	R532	3F
C380	3D	CR454	3E	R172	2F	R270	2C	R416	5F	R534	3F
C382	5D	CR455	3E	R173	2F	R272	2C	R418	4E	R550	2E
C384	3D	CR456	3E	R174	2F	R300	4C	R420	4E	R560	3D
C400	4D	CR457	3E	R200	4A	R302	4C	R422	4E	R564	2D
C402	4D	CR508	5F	R202	4A	R304	5C	R426	3F	R566	2E
C406	5E	CR520	4E	R204	5A	R306	5C	R428	3E	R568	2D
C412	5W	K220	3A	R206	5B	R308	5C	R430	3E		
C418	4E			R208	5B	R310	5B	R432	3E		
C442	3E	Q210	5B	R210	5B	R312	5B	R434	3F	S200	5A
C446	3F	Q212	5B	R212	5B	R322	4C	R438	4F	S220	3A
C450	2E	Q230	4B	R215	4B	R326	3C	R442	3E	S300	5C
C456	2E	Q232	3C	R216	5D	R328	3B	R446	3F	S400	5D
C470	2E	Q260	4B	R218	4B	R330	3C	R450	2E	S500	5F
C500	4F	Q264	2C	R220	4B	R332	3C	R454	3E		
C502	4F	Q320	4B	R222	4B	R334	3C	R456	3E	VR270	3C

INDEX FOR FIG. 9-3



VOLTAGE AND WAVEFORM CONDITIONS

NOTE

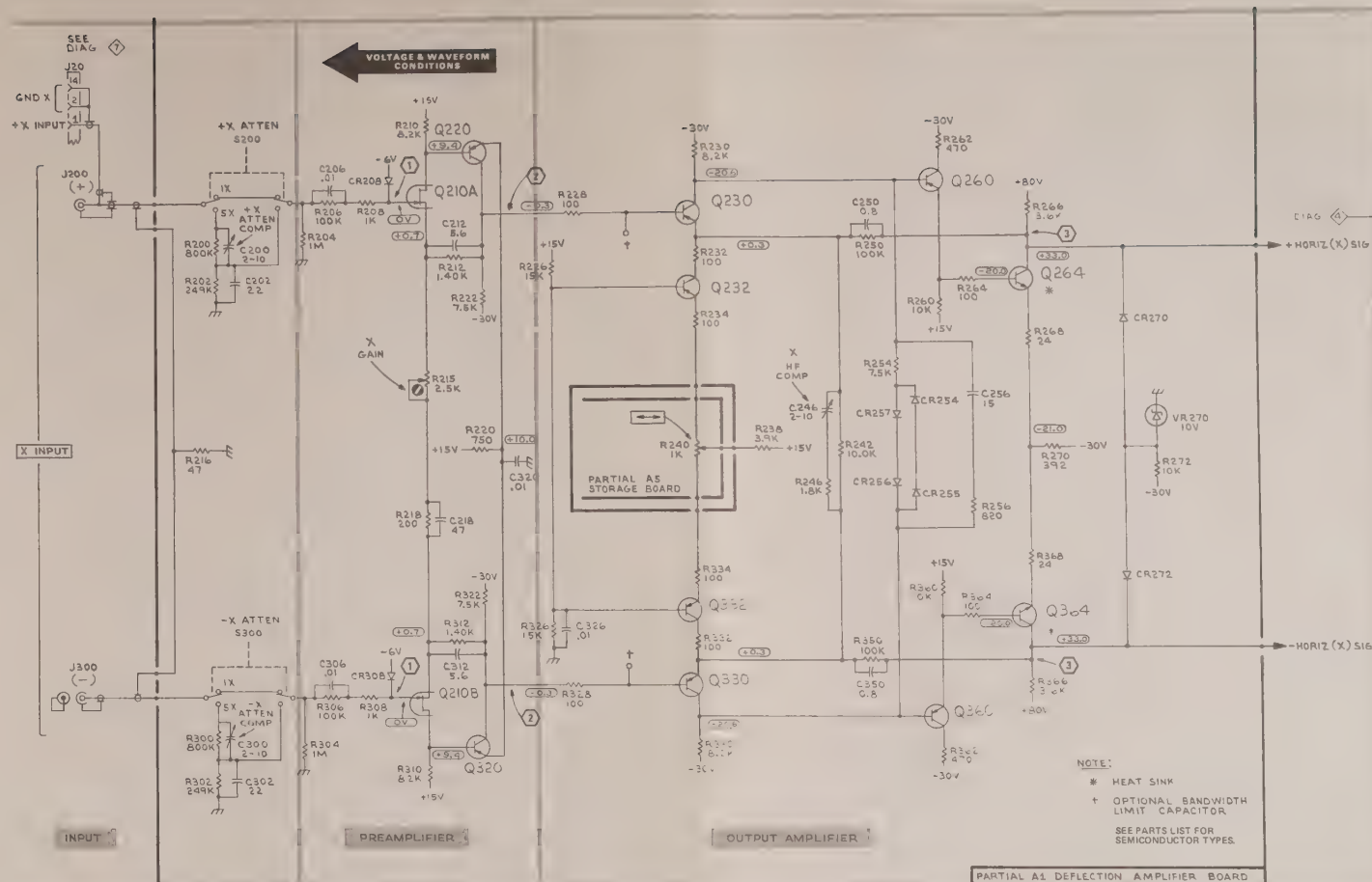
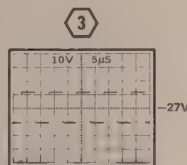
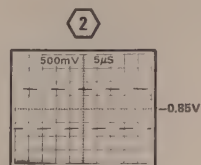
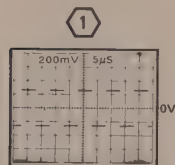
The test equipment used to obtain the voltages and waveforms is listed in Table 6-1, Test Equipment.

VOLTAGE CONDITIONS

The dc voltages indicated on the schematic diagram were obtained with no test signal input using a digital multimeter. The INTENSITY and Position controls were set for a barely visible dot at near center screen with the internal sweep generator disconnected (Option 4 version only).

WAVEFORM CONDITIONS

The following waveforms were monitored with a test oscilloscope and a 10X probe. A negative-going 100 kHz, 0.5 V square wave was applied to the appropriate input connector with the vertical Position control centered, X Atten switches at 1X, internal sweep generator disconnected (Option 4 version only), and the unused input connector grounded (grounding cap installed). The X Gain was adjusted to 1 V for 8 divisions of deflection. The test points shown on the component and waveform test point location illustration with a + or - sign opposite the test point number indicates the input connector to which the test signal was applied.



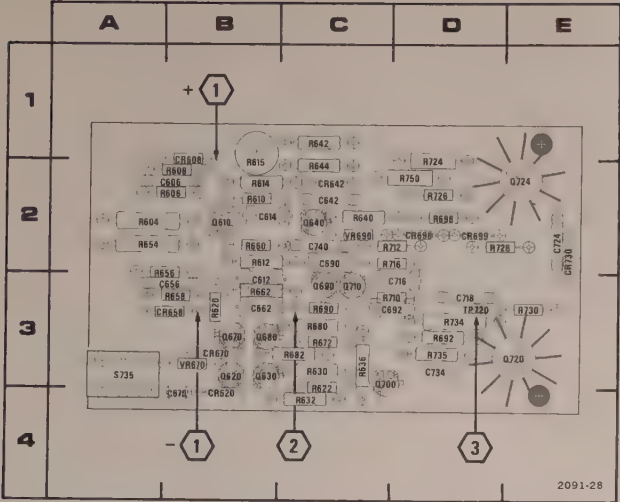
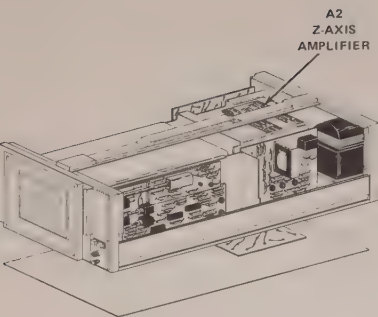


Figure 9-4. A2-Z Axis Amplifier component and waveform test point locations.



CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD
C606	2B	CR620	4B	Q710	3C	R640	2C	R716	2D
C612	3B	CR642	2C	Q720	3E	R642	2C	R724	2D
C614	2B	CR658	3B	Q724	2E	R644	2C	R726	2D
C642	2C	CR670	3B			R654	2A	R728	2D
C656	3B	CR698	2D	R604	2A	R656	3B	R730	3E
C662	3B	CR699	2D	R606	2B	R658	3B	R734	3D
C670	4B	CR730	2E	R608	2B	R660	2B	R735	3D
C690	2C			R610	2B	R662	3B	R750	2D
C692	3D	Q610	2B	R612	2B	R672	3C		
C716	3D	Q620	3B	R614	2B	R680	3C	S735	3A
C718	3D	Q630	3B	R615	1B	R682	3C		
C724	2E	Q640	2C	R620	3B	R690	3C	TP720	3D
C734	3D	Q670	3B	R622	4C	R692	3D		
C740	2C	Q680	3B	R630	3C	R698	2D	VR670	3B
		Q690	3C	R632	4C	R710	3D	VR690	2C
CR608	1B	Q700	3C	R636	3C	R712	2D		

INDEX FOR FIG. 9-4



A3
HIGH-VOLTAGE
POWER SUPPLY

A3 HIGH-VOLTAGE POWER SUPPLY

VOLTAGE AND WAVEFORM CONDITIONS

NOTE

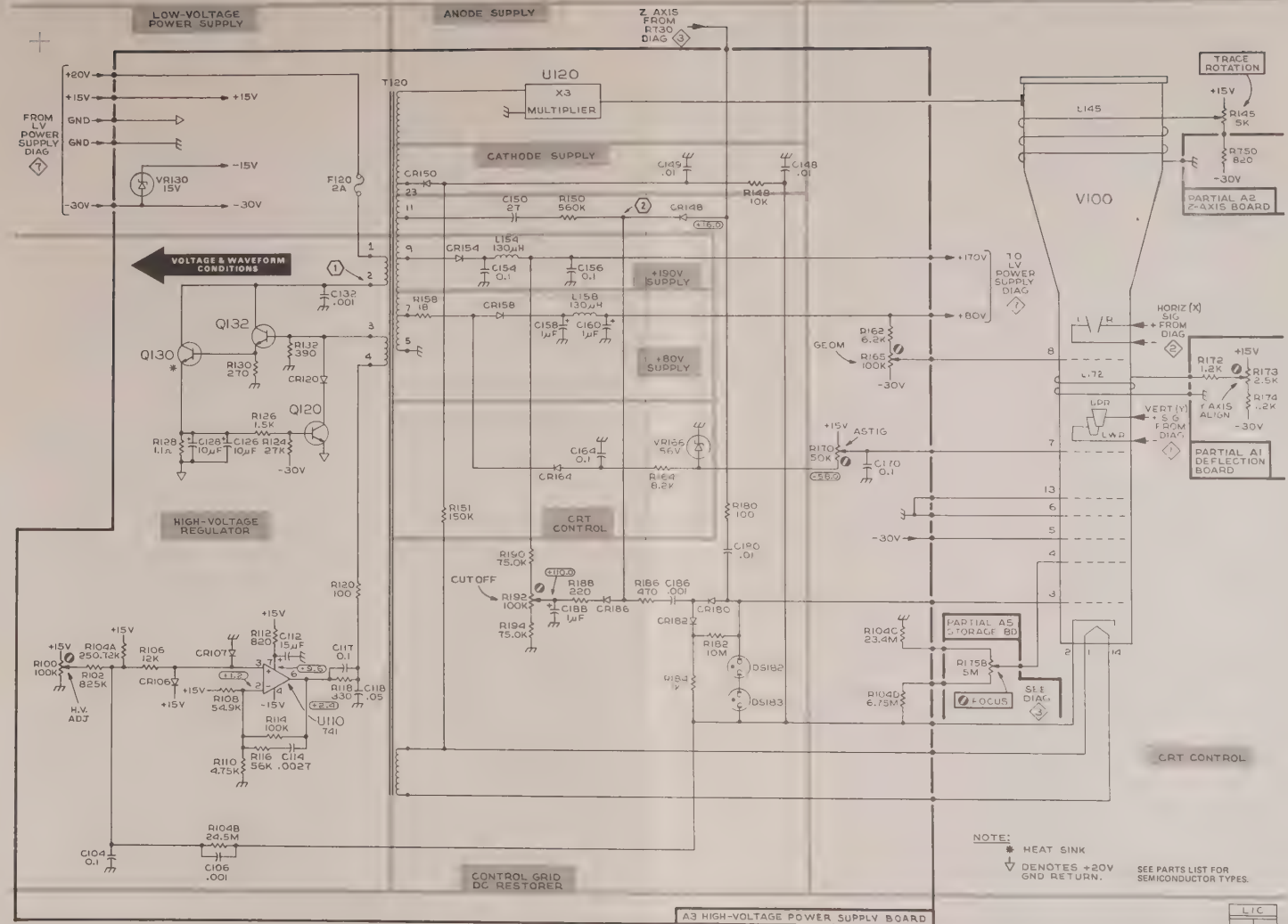
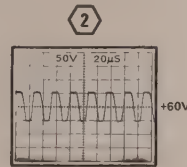
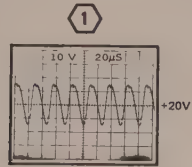
The test equipment used to obtain the voltages and waveforms is listed in Table 6-1, Test Equipment.

VOLTAGE CONDITIONS

The dc voltages indicated on the schematic diagram were obtained with no test signal input using a digital multimeter. The INTENSITY and Position controls were set for a barely visible dot at near center screen with the internal sweep generator disconnected (Option 4 version only).

WAVEFORM CONDITIONS

The following waveforms were monitored by a test oscilloscope and a 10X probe with no test signal applied, internal sweep generator disconnected (Option 4 version only), and INTENSITY control fully counterclockwise.



NOTE:

* HEAT SINK

↓ DENOTES +20V GND RETURN.

SEE PARTS LIST FOR SEMICONDUCTOR TYPES.

L/C
B6

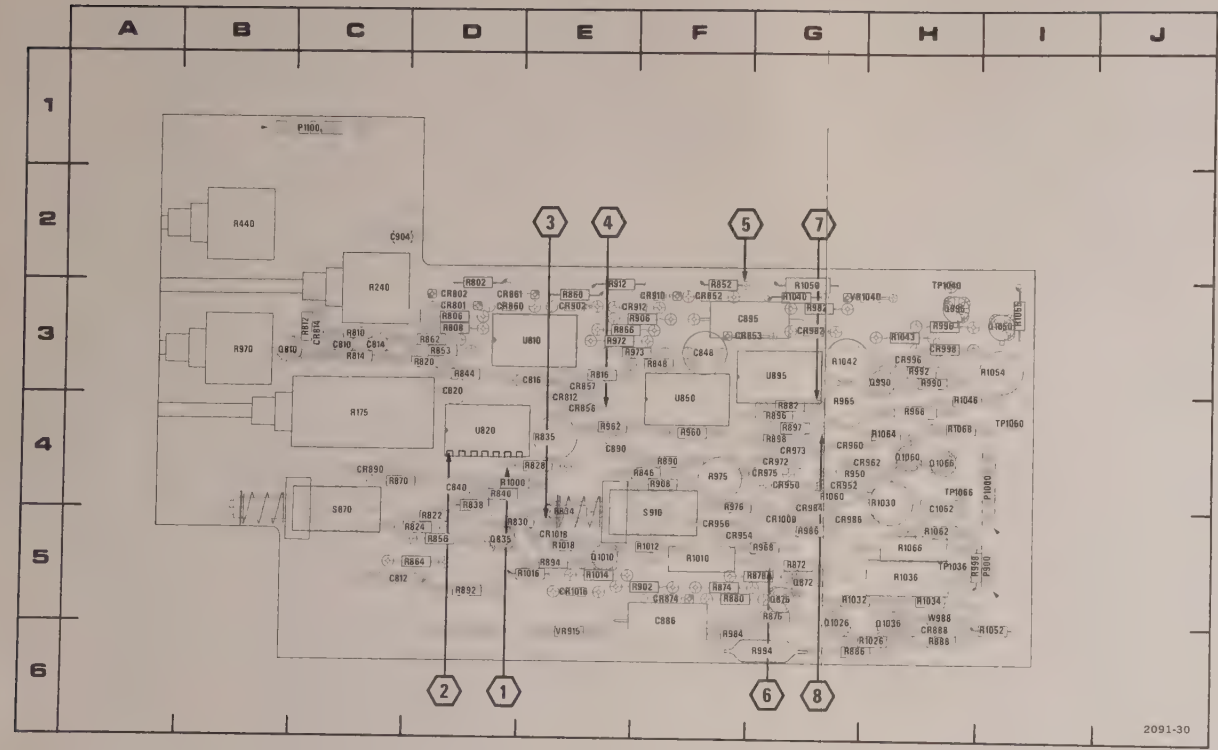
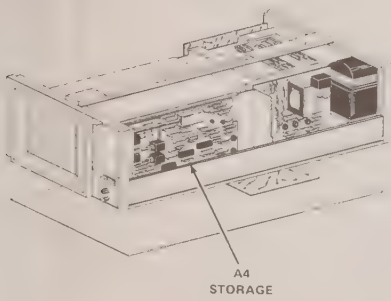


Figure 9-6. A4—Storage Control component and waveform test point locations.

CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD
C810	3C	CR954	5F	Q1066	4H	R866	3E	R976	4F	R1066	5H
C812	5C	CR956	5F			R870	4C	R982	3G	R1068	4H
C814	3C	CR960	4G	R175	4C	R872	5G	R984	6F		
C816	3E	CR962	4H	R240	3C	R874	5F	R986	5G	S870	5C
C820	3D	CR972	4G	R440	2B	R875	5G	R990	3H	S910	5F
C840	4D	CR973	4G	R802	3D	R878	5G	R992	3H		
C848	3F	CR975	4G	R806	3D	R880	5F	R994	6G	TP1036	5H
C886	5F	CR982	3G	R808	3D	R882	4G	R996	3H	TP1040	2H
C890	4E	CR984	4G	R810	3C	R886	6G	R1000	4D	TP1050	4I
C895	3F	CR986	5G	R812	3C	R888	6H	R1010	5F	TP1066	4H
C904	2C	CR996	3H	R814	3C	R890	4F	R1012	5F		
C1062	4H	CR998	3H	R816	3E	R892	5D	R1014	5E	U810	3E
CR801	3D	CR1000	5G	R820	3D	R894	5E	R1016	5E	U820	4D
CR802	3D	CR1016	5E	R822	5D	R896	4G	R1018	5E	U850	5F
CR812	4E	CR1018	5E	R824	5D	R897	4G	R1026	6H	U895	3G
CR814	3C			R828	4E	R898	4G	R1030	4H		
CR852	3F	P900	5I	R830	5D	R902	5F	R1032	5G	W988	5H
CR853	3F	P1000	4I	R834	5E	R906	3E	R1034	5H		
CR856	4E			R835	4E	R908	4F	R1036	5H	VR915	6E
CR857	3E	Q810	3B	R838	4D	R912	3E	R1040	3G	VR1040	3H
CR860	3D	Q835	5D	R840	4D	R950	4G	R1042	3G		
CR861	3D	Q872	5G	R844	3D	R960	4F	R1043	3H		
CR874	5F	Q876	5G	R846	4F	R962	4E	R1046	4H		
CR888	5H	Q990	3H	R848	3F	R965	4G	R1050	3G		
CR890	4C	Q996	3H	R852	3F	R966	4H	R1052	6I		
CR902	3E	Q1010	5E	R853	3D	R968	5G	R1054	3I		
CR910	3F	Q1026	5G	R856	5D	R970	3B	R1055	3I		
CR912	3E	Q1036	5H	R860	3E	R972	3E	R1060	4G		
CR950	4G	Q1050	3I	R862	3D	R973	3E	R1062	5H		
CR952	4G	Q1060	4H	R864	5D	R975	4F	R1064	4H		

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VOLTAGE AND WAVEFORM CONDITIONS

NOTE

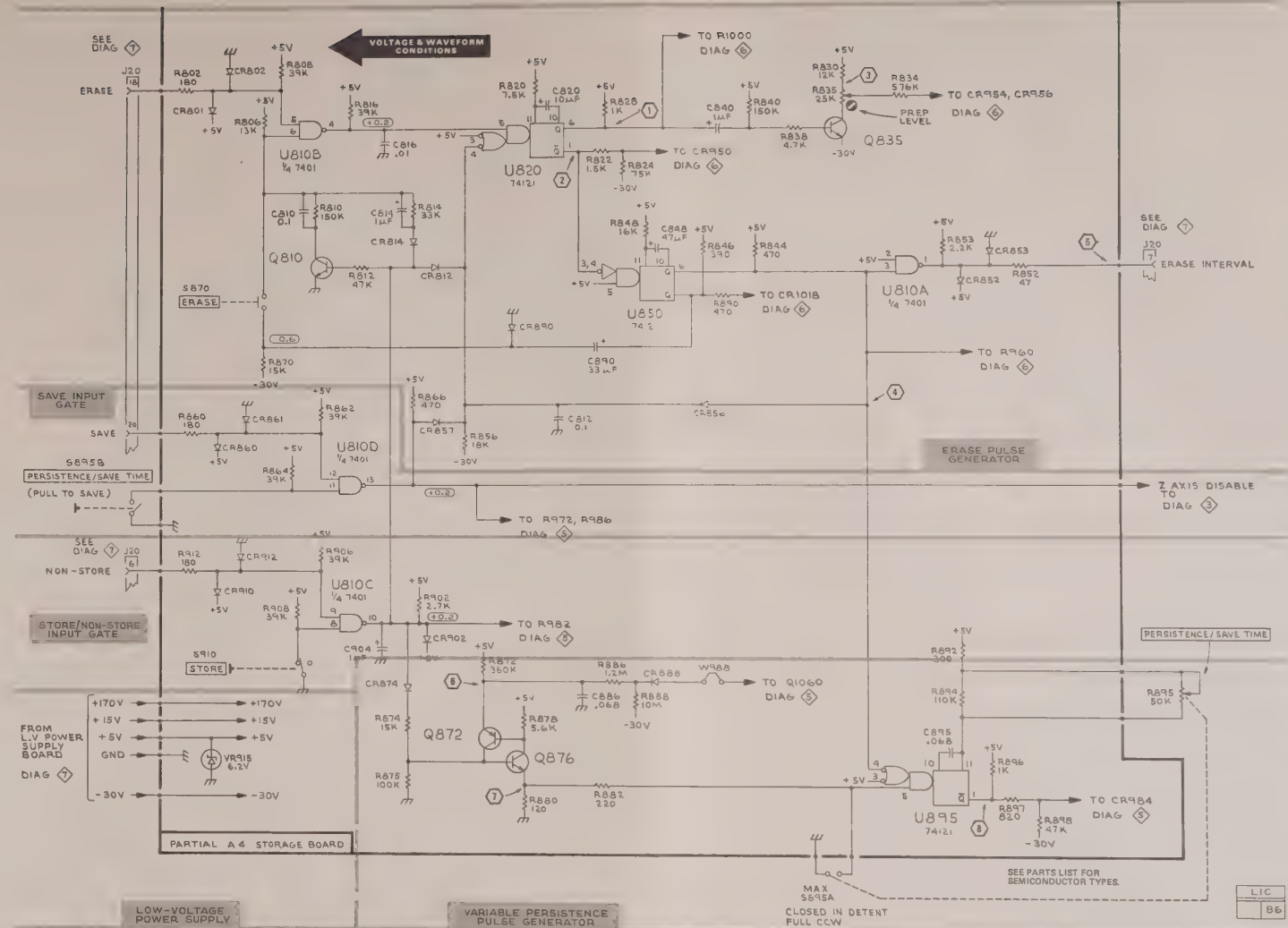
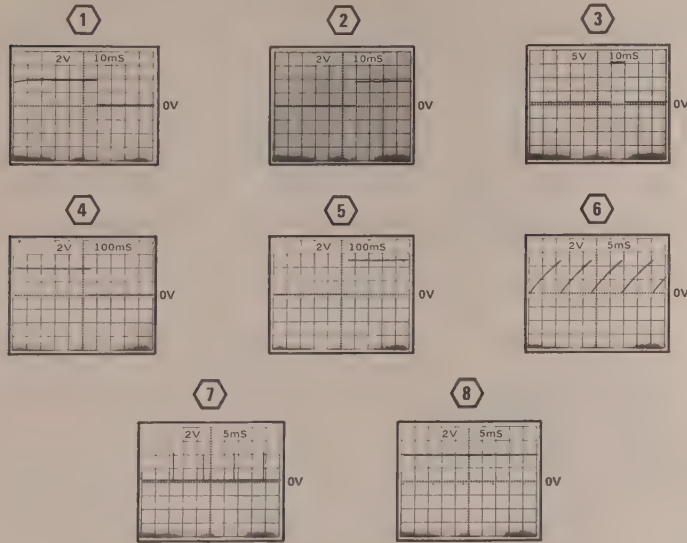
The test equipment used to obtain the voltages and waveforms is listed in Table 6-1, Test Equipment.

VOLTAGE CONDITIONS

The dc voltages indicated on the schematic diagram were obtained with no test signal input using a digital multimeter. The INTENSITY and Position controls were set for a barely visible dot at near center screen with the internal sweep generator disconnected (Option 4 version only). The store button and the PERSISTENCE/SAVE TIME knob were pushed in.

WAVEFORM CONDITIONS

The following waveforms were monitored by a test oscilloscope and a 10X probe with no test signal applied. The STORE button was pushed in, INTENSITY control fully counterclockwise, and PERSISTENCE/SAVE TIME control pushed in and set to midrange. Waveforms at test points 1 through 5 were obtained when the ERASE button was pushed in; waveforms at test points 6 through 8 with the ERASE button out. The test oscilloscope sweep was triggered from test point 1.





A4
STORAGE

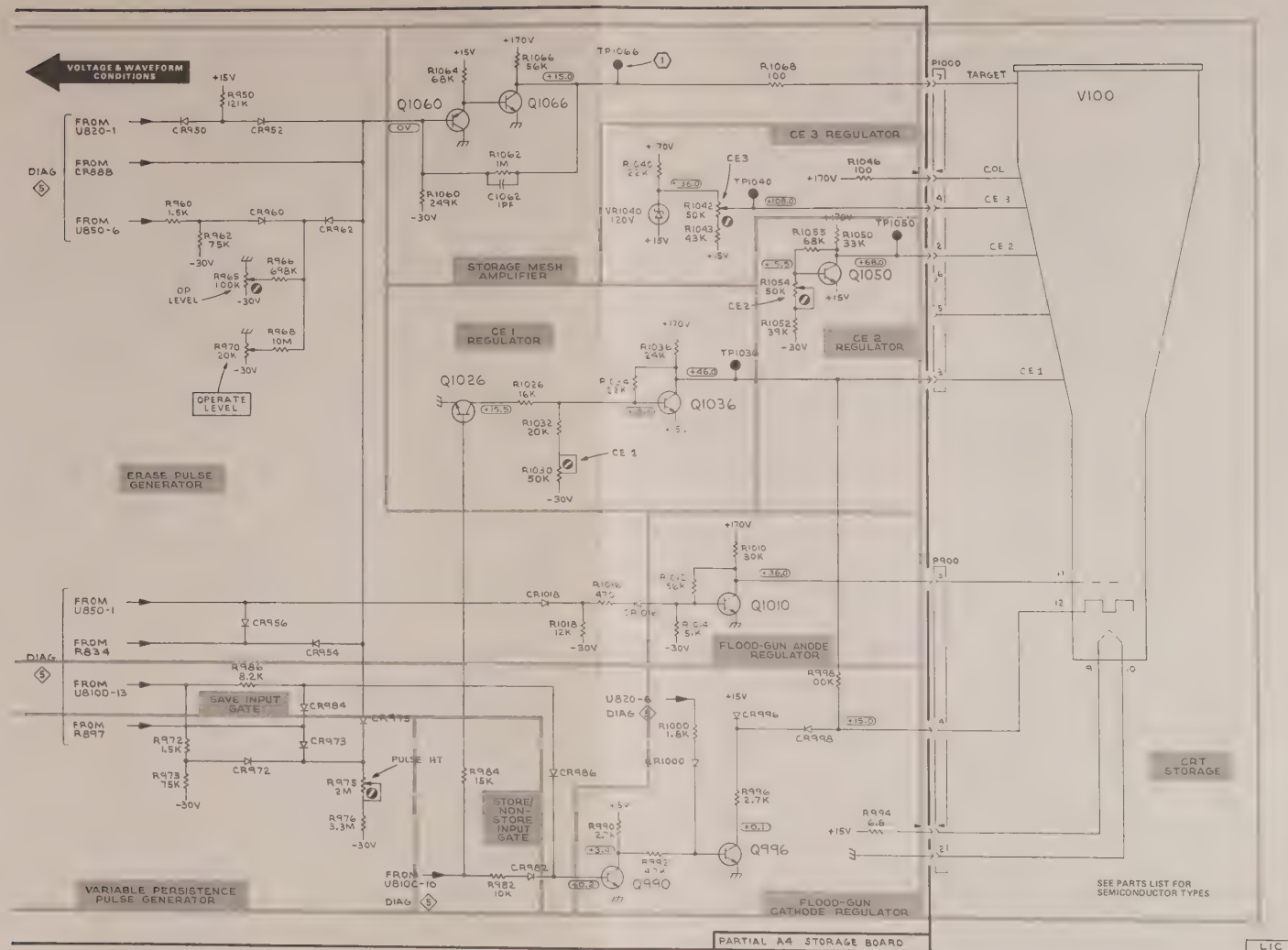
NOTE

VOLTAGE CONDITIONS

The dc voltages indicated on the schematic diagram were obtained with no test signal input using a digital multimeter. The INTENSITY and Position controls were set for a barely visible dot at near center screen with the internal sweep generator disconnected (Option 4 version only). The STORE button was pushed in, OPERATE LEVEL control fully clockwise, and PERSISTENCE/SAVE TIME control pushed in and set fully counterclockwise (MAX).

WAVEFORM CONDITIONS

The following waveforms were monitored by a test oscilloscope and a 10X probe with no test signal applied. The STORE button was pushed, INTENSITY control fully counterclockwise, and PERSISTENCE/SAVE TIME control pushed in and set to midrange. Waveform was obtained when the ERASE button was pushed in. The test oscilloscope sweep was triggered from test point 1 shown on the Storage Control schematic (diagram 5).



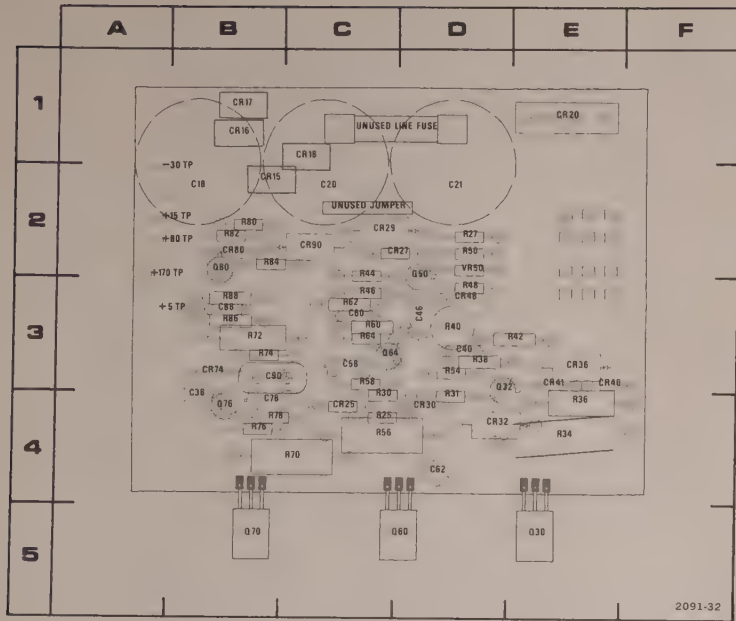
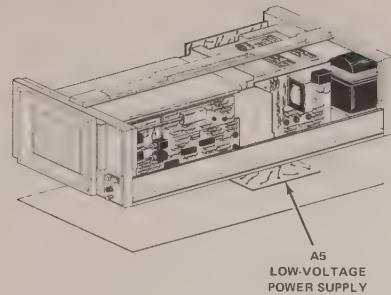


Figure 9-8. A5—Low-Voltage Power Supply component locations.



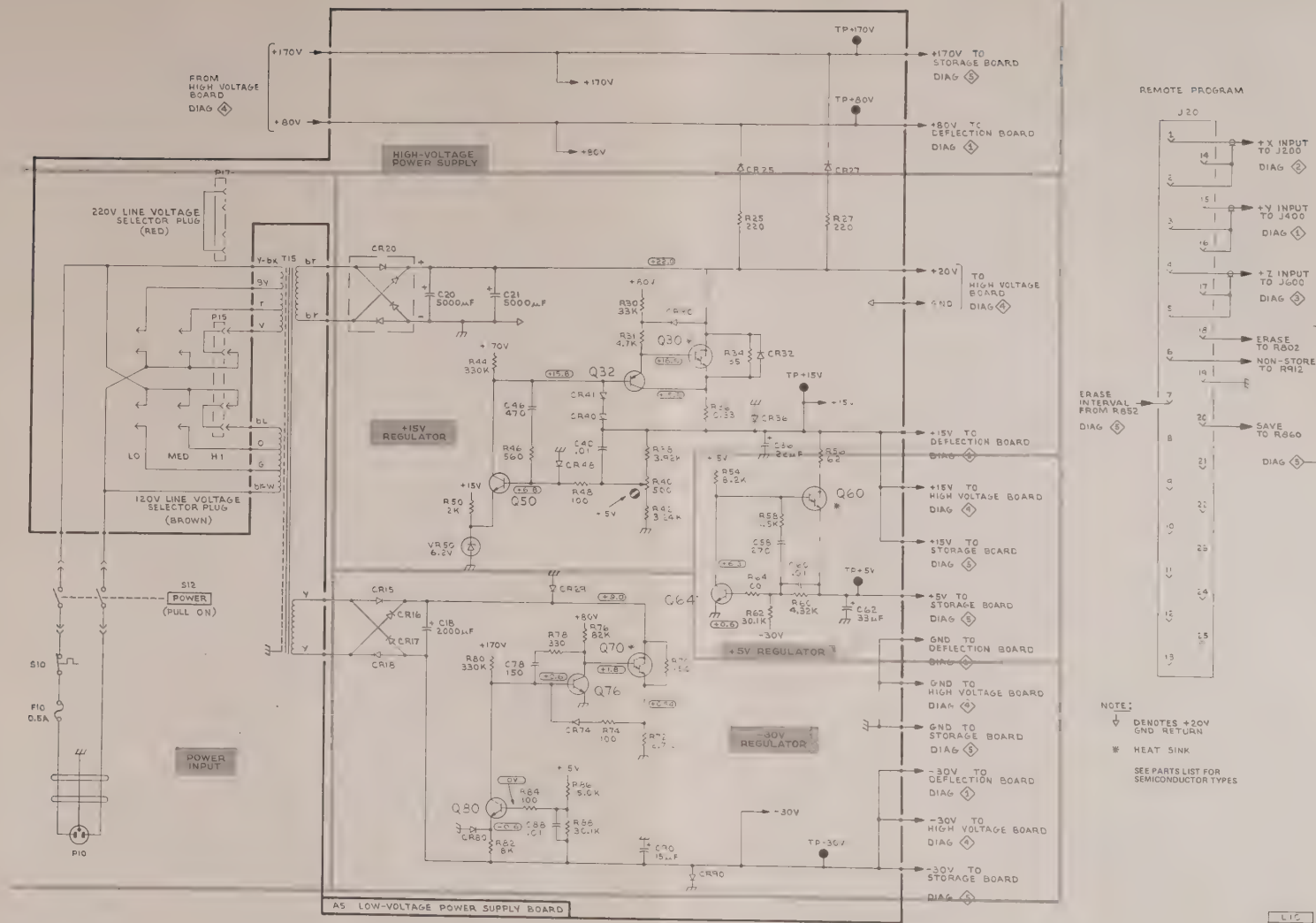
CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD
C18	2B	CR15	2B	CR41	3E	Q76	4B	R80	2B
C20	1C	CR16	1B	CR48	3D	Q80	2B	R92	2B
C21	2D	CR17	1B	CR74	3B			R84	2B
C36	4B	CR18	1C	CR80	2B	R25	4C	R86	3B
C40	3D	CR20	1E	CR90	2C	R27	2D	R88	3B
C46	3D	CR25	4C			R30	4C		
C53	3C	CR27	2C	Q30	5E	R31	4D	VR50	2D
C60	3C	CR29	2C	Q32	3D	R34	4E		
C62	4D	CR30	4D	Q50	2D	R36	4E		
C78	4B	CR32	4D	Q60	5D	R74	3B		
C88	3B	CR36	3E	Q64	3C	R76	4B		
C90	3B	CR40	3E	Q70	5B	R78	4B		

INDEX FOR FIG.9-8

NOTE

The test equipment used to obtain the voltages is listed in Table 6-1, Test Equipment.

The dc voltages indicated on the schematic diagram were obtained with no test signal input using a digital multimeter. The INTENSITY and Position controls were set for a barely visible dot at near center screen with the internal sweep generator disconnected (Option 4 version only).



NOTE:

↓ DENOTES +20V
GND RETURN

※ HEAT SINK

SEE PARTS LIST FOR
SEMICONDUCTOR TYPES.



VOLTAGE AND WAVEFORM CONDITIONS

NOTE

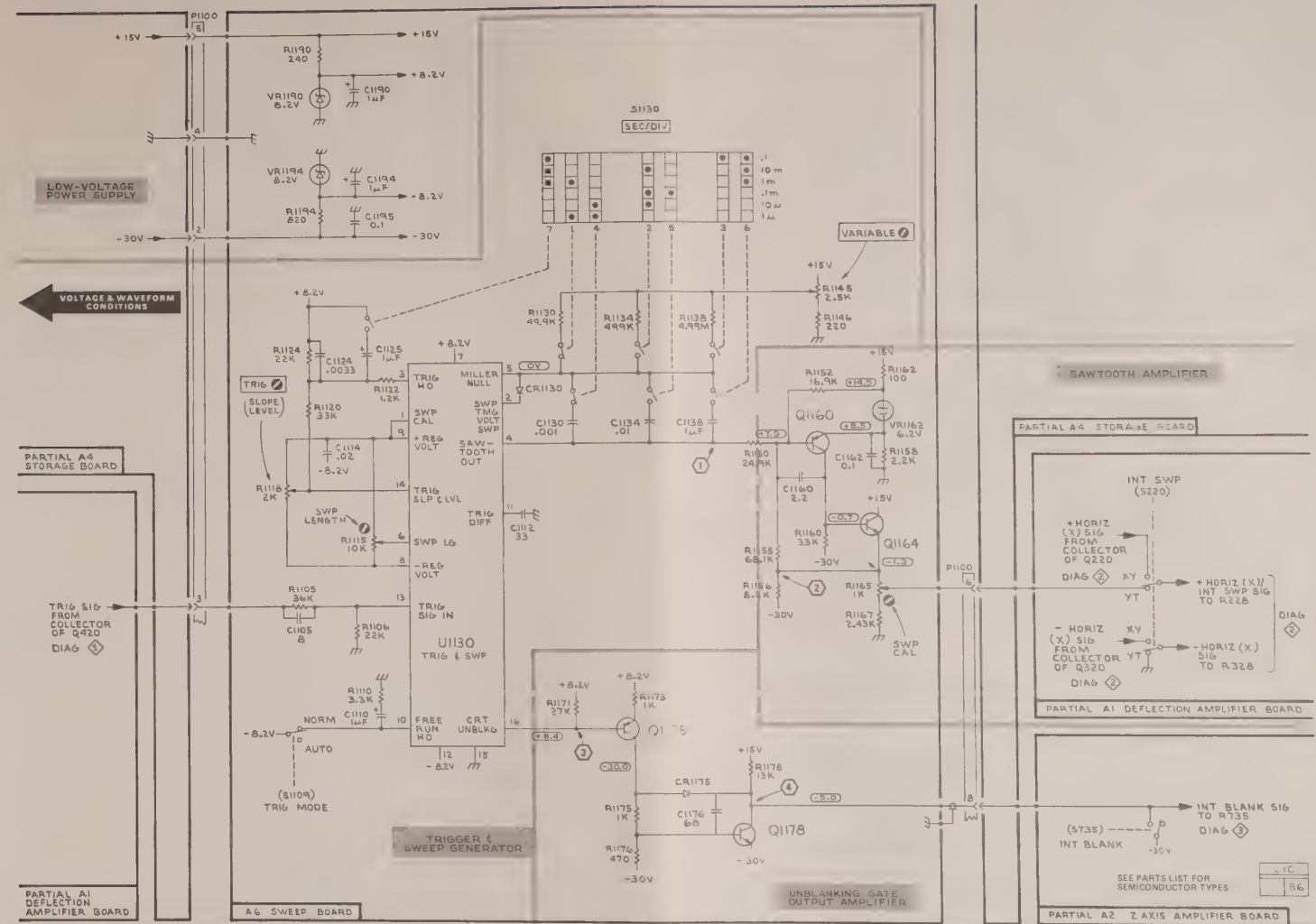
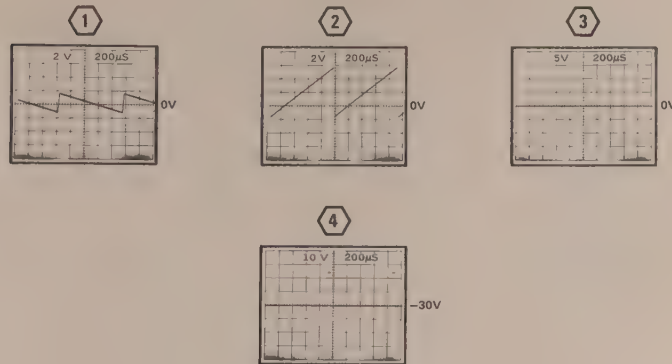
The test equipment used to obtain the voltages and waveforms is listed in Table 6-1, Test Equipment.

VOLTAGE CONDITIONS

The dc voltages indicated on the schematic diagram were obtained with no test signal input using a digital multimeter. The INTENSITY and Position controls were set for a barely visible trace at near center screen with the internal sweep generator connected. The internal Trig Mode switch (S1109) was set to the Normal position.

WAVEFORM CONDITIONS

The following waveforms were monitored by a test oscilloscope and a 10X probe with no test signal applied and the internal sweep generator connected. The internal Trig Mode switch (S1109) was set to the Auto position, SEC/DIV switch to .1 m, and VARIABLE control fully clockwise (calibrated).



TROUBLESHOOTING CHART INSTRUCTIONS:

1. Beginning at the top left block of the chart proceed to the right until the Monitor does not perform as indicated.
2. Then follow the dashed line as the symptom indicates. Each shaded block indicates a circuit or a stage which may be the cause of the malfunction. Refer to section 4, Theory of Operation, for a detailed discussion.

NOTE

For instruments equipped with the Option 4 Sweep circuit, disconnect the sweep (by reversing the procedure given in section 3, Installation) before beginning this procedure.

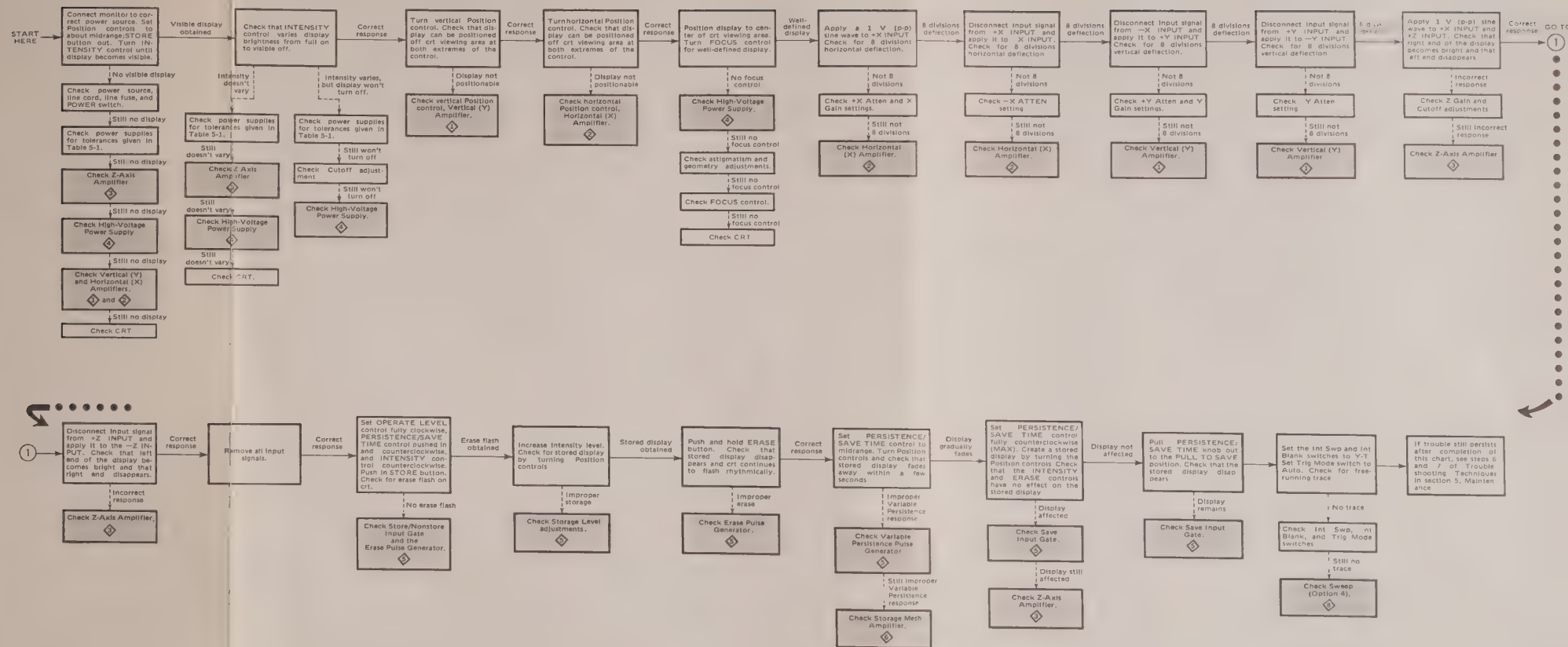


Figure 9-10. Troubleshooting chart.

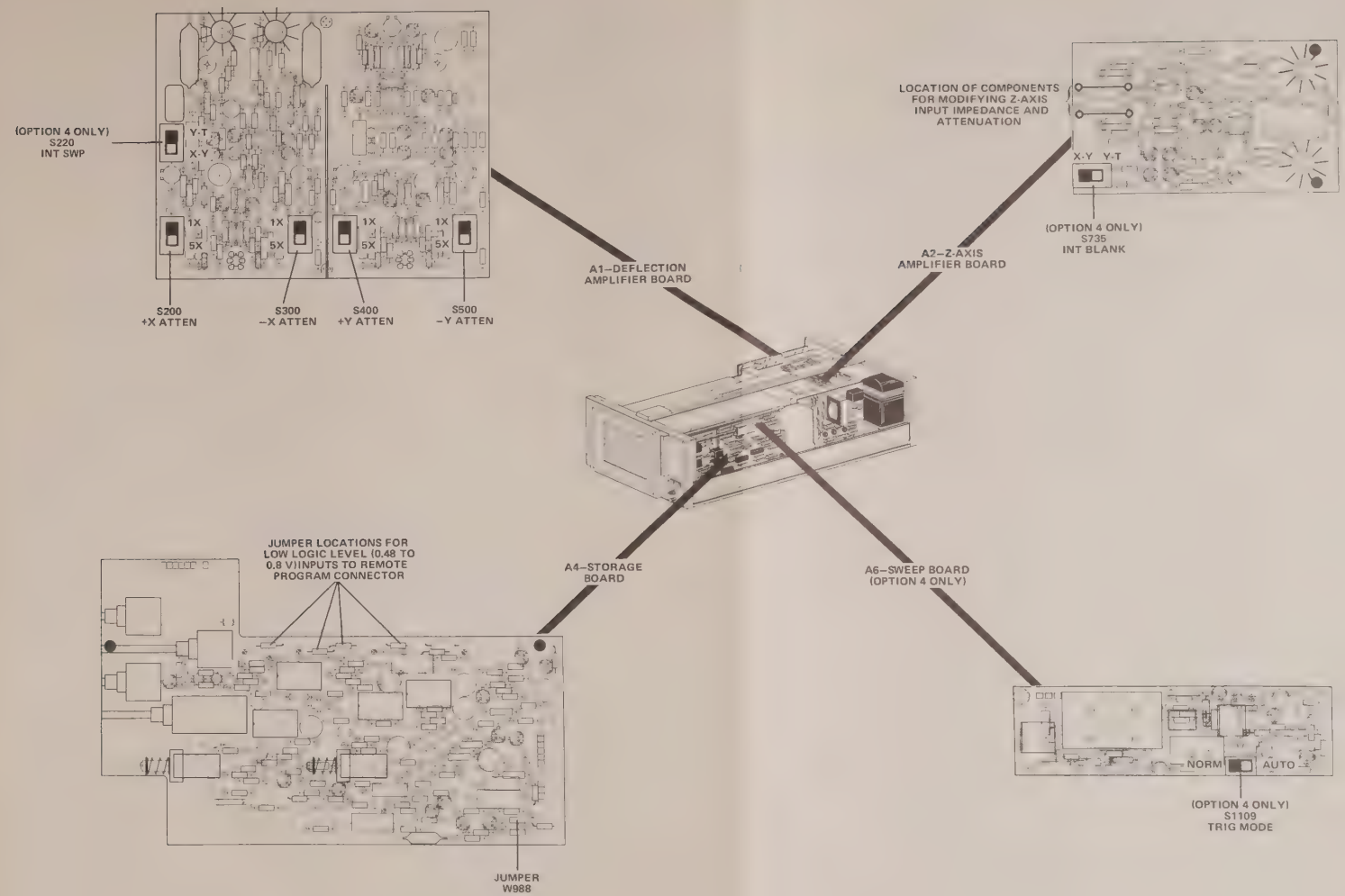


Figure 9-11. Internal control and selector locations.

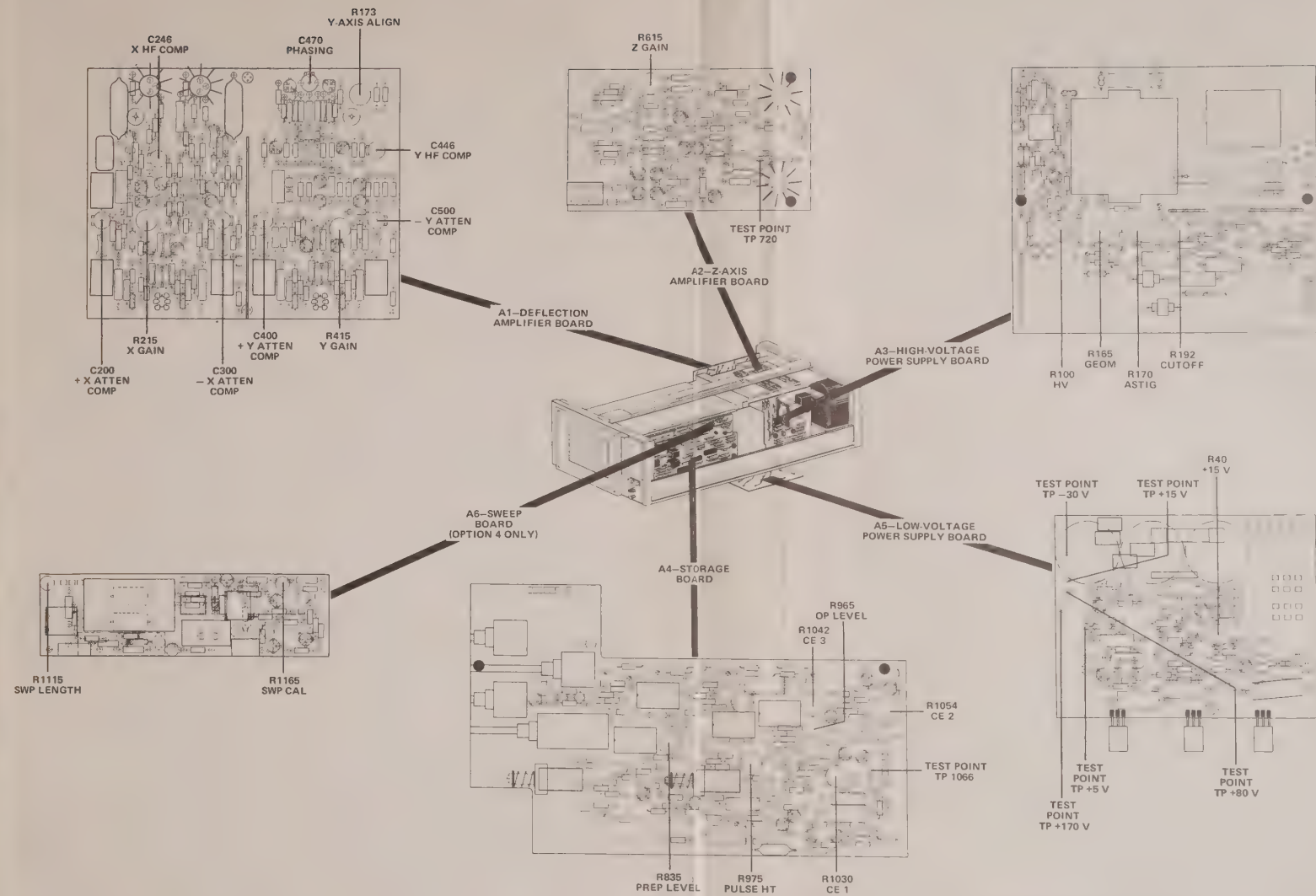


Figure 9-12. Test point and adjustment locations.

English To Metric Conversion			
Inches	Centimeters	Inches	Centimeters
0.003	0.008	0.600	1.524
0.005	0.013	0.623	1.582
0.008	0.020	0.625	1.588
0.010	0.025		
0.015	0.038	0.665	1.689
		0.700	1.778
0.016	0.041	0.706	1.793
0.020	0.051	0.712	1.809
0.023	0.058	0.787	1.999
0.028	0.071	0.800	2.032
0.030	0.076	.900	2.286
		1.020	2.591
0.035	0.089	1.161	2.949
0.040	0.102	1.350	3.429
0.062	0.158	1.500	3.810
0.075	0.191		
0.080	0.203	1.548	3.932
		2.407	6.116
0.093	0.236	3.187	8.087
0.125	0.318	3.492	8.870
0.140	0.356	3.625	9.208
0.197	0.500		
0.320	0.813	4.188	10.638
		5.062	12.858
0.339	0.861	5.125	13.018
0.394	1.001	5.224	13.269
0.480	1.219	5.578	14.168
0.486	1.234		
0.531	1.349	8.325	21.273
		10.875	27.623
0.550	1.397	16.262	41.306
0.572	1.453	18.312	46.513

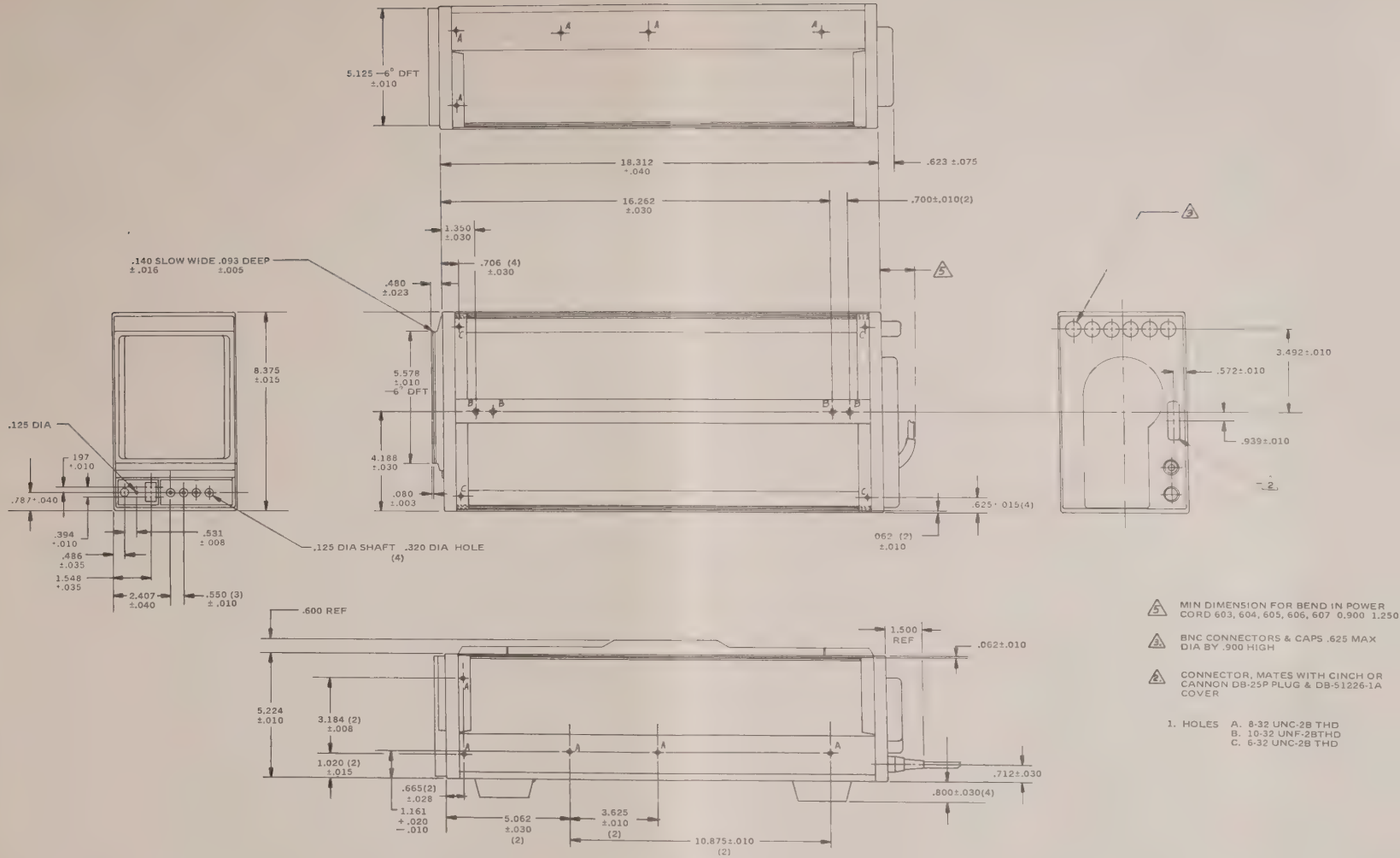


Figure 9-13. Detailed dimensional drawing.

REPLACEABLE MECHANICAL PARTS

PARTS ORDERING INFORMATION

Replacement parts are available from or through your local Tektronix, Inc. Field Office or representative.

Changes to Tektronix instruments are sometimes made to accommodate improved components as they become available, and to give you the benefit of the latest circuit improvements developed in our engineering department. It is therefore important, when ordering parts, to include the following information in your order: Part number, instrument type or number, serial number, and modification number if applicable.

If a part you have ordered has been replaced with a new or improved part, your local Tektronix, Inc. Field Office or representative will contact you concerning any change in part number.

Change information, if any, is located at the rear of this manual.

SPECIAL NOTES AND SYMBOLS

X000	Part first added at this serial number
00X	Part removed after this serial number

FIGURE AND INDEX NUMBERS

Items in this section are referenced by figure and index numbers to the illustrations.

INDENTATION SYSTEM

This mechanical parts list is indented to indicate item relationships. Following is an example of the indentation system used in the description column.

1	2	3	4	5	Name & Description
					<i>Assembly and/or Component</i>
					<i>Attaching parts for Assembly and/or Component</i>
					--- * ---
					<i>Detail Part of Assembly and/or Component</i>
					<i>Attaching parts for Detail Part</i>
					--- * ---
					<i>Parts of Detail Part</i>
					<i>Attaching parts for Parts of Detail Part</i>
					--- * ---

Attaching Parts always appear in the same indentation as the item it mounts, while the detail parts are indented to the right. Indented items are part of, and included with, the next higher indentation. The separation symbol --- * --- indicates the end of attaching parts.

Attaching parts must be purchased separately, unless otherwise specified.

ITEM NAME

In the Parts List, an Item Name is separated from the description by a colon (:). Because of space limitations, an Item Name may sometimes appear as incomplete. For further Item Name identification, the U.S. Federal Cataloging Handbook H6-1 can be utilized where possible.

ABBREVIATIONS

#	INCH	ELCTRN	ELECTRON	IN	INCH	SE	SINGLE END
ACTR	NUMBER SIZE	ELEC	ELECTRICAL	INCAND	INCANDESCENT	SECT	SECTION
ADPTR	ACTUATOR	ELCTLT	ELECTROLYTIC	INSUL	INSULATOR	SEMICON	SEMICONDUCTOR
ALIGN	ADAPTER	ELEM	ELEMENT	INTL	INTERNAL	SHLD	SHIELD
AL	ALIGNMENT	EPL	ELECTRICAL PARTS LIST	LPHLDR	LAMPHOLDER	SHLDR	SHOULDERED
ASSEM	ALUMINUM	EOPT	EQUIPMENT	MACH	MACHINE	SKT	SOCKET
ASSY	ASSEMBLED	EXT	EXTERNAL	MECH	MECHANICAL	SL	SLIDE
ATTEN	ASSEMBLY	FIL	FILLISTER HEAD	MTG	MOUNTING	SFLKLG	SELF-LOCKING
AWG	ATTENUATOR	FLEX	FLEXIBLE	NIP	NIPPLE	SLVG	SLEEVEING
BD	BOARD	FLH	FLAT HEAD	NON WIRE	NOT WIRE WOUND	SPR	SPRING
BRKT	AMERICAN WIRE GAGE	FLTR	FILTER	OBD	ORDER BY DESCRIPTION	SQ	SQUARE
BRS	BRACKET	FR	FRAME or FRONT	OD	OUTSIDE DIAMETER	SST	STAINLESS STEEL
BRZ	BRASS	FSTNR	FASTENER	OVH	OVAL HEAD	STL	STEEL
BSHG	BRONZE	FT	FOOT	PH BRZ	PHOSPHOR BRONZE	SW	SWITCH
CAB	BUSHING	FXD	FIXED	PL	PLAIN or PLATE	T	TUBE
CAP	CABINET	GSKT	GASKET	PLSTC	PLASTIC	TERM	TERMINAL
CER	CAPACITOR	HDL	HANDLE	PN	PART NUMBER	THD	THREAD
CHAS	CERAMIC	HEX	HEXAGON	PNH	PAN HEAD	THK	THICK
CKT	CHASSIS	HEX HD	HEXAGONAL HEAD	PWR	POWER	TNSN	TENSION
COMP	CIRCUIT	HEX SOC	HEXAGONAL SOCKET	RCPT	RECEPTACLE	TPG	TAPPING
CONN	COMPOSITION	HLCPS	HELICAL COMPRESSION	RES	RESISTOR	TRH	TRUSS HEAD
COV	CONNECTOR	HLEXT	HELICAL EXTENSION	RGD	RIGID	V	VOLTAGE
CPLG	COVER	HV	HIGH VOLTAGE	RLF	RELIEF	VAR	VARIABLE
CRT	COUPLING	IC	INTEGRATED CIRCUIT	RTNR	RETAINER	W/	WITH
DEG	CATHODE RAY TUBE	ID	INSIDE DIAMETER	SCH	SOCKET HEAD	WSHR	WASHER
DWR	DEGREE	IDNT	IDENTIFICATION	SCOPE	OSCILLOSCOPE	XFMR	TRANSFORMER
	DRAWER	IMPLR	IMPELLER	SCR	SCREW	XSTR	TRANSISTOR

CROSS INDEX MFR. CODE NUMBER TO MANUFACTURER

MFR.CODE	MANUFACTURER	ADDRESS	CITY,STATE,ZIP
0000C	GETTIG ENGINEERING AND MANUFACTURING CO.		SPRINGMILL, PA 16875
00779	AMP, INC.	P. O. BOX 3608	HARRISBURG, PA 17105
01295	TEXAS INSTRUMENTS, INC., SEMICONDUCTOR GROUP	P. O. BOX 5012	DALLAS, TX 75222
05820	WAKEFIELD ENGINEERING, INC.	AUDUBON ROAD	WAKEFIELD, MA 01880
08261	SPECTRA-STRIP CORP.	7100 LAMPSON AVE.	GARDEN GROVE, CA 92642
09133	KIERULFF ELECTRONICS, INC.	2585 COMMERCE WAY	LOS ANGELES, CA 90040
12327	FREEWAY CORP.	9301 ALLEN DR.	CLEVELAND, OH 44125
12360	ALBANY PRODUCTS CO., DIV. OF PNEUMO DYNAMICS CORP.	351 CONNECTICUT AVE.	SOUTH NORWALK, CT 06856
22526	BERG ELECTRONICS, INC.	YOUK EXPRESSWAY	NEW CUMBERLAND, PA 17070
23499	GAVITT WIRE AND CABLE, DIVISION OF RSC INDUSTRIES, INC.	455 N. QUINCE ST.	ESCONDIDO, CA 92025
28520	HEYMAN MFG. CO.	147 N. MICHIGAN AVE.	KENILWORTH, NJ 07033
70485	ATLANTIC INDIA RUBBER WORKS, INC.	571 W. POLK ST.	CHICAGO, IL 60607
71159	BRISTOL SOCKET SCREW, DIV. OF AMERICAN CHAIN AND CABLE CO., INC.	P O BOX 2244, 40 BRISTOL ST.	WATERBURY, CT 06720
71468	ITT CANNON ELECTRIC	666 E. DYER RD.	SANTA ANA, CA 92702
71785	TRW ELECTRONIC COMPONENTS, CINCH CONNECTOR OPERATIONS	1501 MORSE AVE.	ELK GROVE VILLAGE, IL 60007
73743	FISCHER SPECIAL MFG. CO.	446 MORGAN ST.	CINCINNATI, OH 45206
74445	HOLO-KROME CO.	31 BROOK ST. WEST	HARTFORD, CT 06110
75915	LITTELFUSE, INC.	800 E. NORTHWEST HWY	DES PLAINES, IL 60016
78189	ILLINOIS TOOL WORKS, INC. SHAKEPROOF DIVISION	ST. CHARLES ROAD	ELGIN, IL 60120
78471	TILLEY MFG. CO.	900 INDUSTRIAL RD.	SAN CARLOS, CA 94070
79136	WALDES, KOHINOOR, INC.	47-16 AUSTEL PLACE	LONG ISLAND CITY, NY 11101
79807	WROUGHT WASHER MFG. CO.	2100 S. O BAY ST.	MILWAUKEE, WI 53207
80009	TEKTRONIX, INC.	P. O. BOX 500	BEAVERTON, OR 97005
82647	TEXAS INSTRUMENTS, INC., CONTROL PRODUCTS DIV.	34 FOREST ST.	ATTLEBORO, MA 02703
83385	CENTRAL SCREW CO.	2530 CRESCENT DR.	BROADVIEW, IL 60153
83501	GAVITT WIRE AND CABLE, DIVISION OF RSC INDUSTRIES, INC.	CENTRAL ST.	BROOKFIELD, MA 01506
83907	ACCURATE RUBBER PRODUCTS CO.	123 N. RACINE	CHICAGO, IL 60607
95937	FEDERAL TELEVISION DIV., CARDWELL CONDENSER CORP.	80 E. MONTAUK HWY.	LINDENHURST, NY 11757
95987	WECKESSER CO., INC.	4444 WEST IRVING PARK RD.	CHICAGO, IL 60641

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	No. Dscont	Qty	1	2	3	4	5	Name & Description	Mfr Code	Mfr Part Number
1-1	390-0270-00 ¹			1						COVER, MONITOR: LEFT	80009	390-0270-00
	390-0543-00 ²			1						COVER, SCOPE: SIDE	80009	390-0543-00
	214-0812-00			2						. FASTENER, PAWL:	80009	214-0812-00
-2	386-0226-00			2						. . PL, LATCH LKG: FOR 0.080 INCH THICKNESS	80009	386-0226-00
-3	386-0227-00			2						. . PL, LATCH INDEX:	80009	386-0227-00
-4	214-0603-01			2						. . PIN, SECURING: 0.27 INCH LONG	80009	214-0603-01
-5	214-0604-00			2						. . WASH., SPG TNSN: 0.26 ID X 0.47 INCH OD	80009	214-0604-00
-6	390-0244-00 ¹			1						COVER, MONITOR: RIGHT	80009	390-0244-00
	390-0543-00 ²			1						COVER, SCOPE: SIDE	80009	390-0543-00
	214-0812-00			2						. FASTENER, PAWL:	80009	214-0812-00
-7	386-0226-00			2						. . PL, LATCH LKG: FOR 0.080 INCH THICKNESS	80009	386-0226-00
-8	386-0227-00			2						. . PL, LATCH INDEX:	80009	386-0227-00
-9	214-0603-01			2						. . PIN, SECURING: 0.27 INCH LONG	80009	214-0603-01
-10	214-0604-00			2						. . WASH., SPG TNSN: 0.26 ID X 0.47 INCH OD	80009	214-0604-00
-11	348-0275-00 ³			1						FLIPSTAND, CAB.:	80009	348-0275-00
-12	390-0280-00 ^{1,3}			1						COVER, SCOPE: BOTTOM	80009	390-0280-00
	390-0523-00 ²			1						COVER, SCOPE: BOTTOM	80009	390-0523-00
	214-0812-00			4						. FASTENER, PAWL:	80009	214-0812-00
-13	386-0226-00			4						. . PL, LATCH LKG: FOR 0.080 INCH THICKNESS	80009	386-0226-00
-14	386-0227-00			4						. . PL, LATCH INDEX:	80009	386-0227-00
-15	214-0603-01			4						. . PIN, SECURING: 0.27 INCH LONG	80009	214-0603-01
-16	214-0604-00			4						. . WASH., SPG TNSN: 0.26 ID X 0.47 INCH OD	80009	214-0604-00
-17	348-0074-00			2						SPT PIVOT, FLIP: RIGHT FRONT AND LEFT REAR (ATTACHING PARTS FOR EACH)	80009	348-0074-00
-18	211-0532-00			1						. SCREW, MACHINE: 6-32 X 0.75 INCH, FLH STL	83385	OBD
-19	210-0457-00			2						. NUT, PLAIN, EXT W: 6-32 X 0.312 INCH, STL - - - * - - -	83385	OBD
-20	348-0207-00			2						. FOOT, CABINET: RIGHT FRONT AND LEFT REAR	80009	348-0207-00
-21	348-0073-00			2						SPT PIVOT, FLIP: LEFT FRONT AND RIGHT REAR (ATTACHING PARTS FOR EACH)	80009	348-0073-00
-22	211-0532-00			2						. SCREW, MACHINE: 6-32 X 0.75 INCH, FLH STL	83385	OBD
-23	210-0457-00			2						. NUT, PLAIN, EXT W: 6-32 X 0.312 INCH, STL - - - * - - -	83385	OBD
-24	348-0208-00			2						. FOOT, CABINET: LEFT FRONT AND RIGHT REAR	80009	348-0208-00
	390-0281-00 ⁴			1						COVER, SCOPE: BOTTOM	80009	390-0281-00
	214-0812-00			4						. FASTENER, PAWL:	80009	214-0812-00
	386-0226-00			4						. . PL, LATCH LKG: FOR 0.080 INCH THICKNESS	80009	386-0226-00
	386-0227-00			4						. . PL, LATCH INDEX:	80009	386-0227-00
	214-0603-01			4						. . PIN, SECURING: 0.27 INCH LONG	80009	214-0603-01
	214-0604-00			4						. . WASH., SPG TNSN: 0.26 ID X 0.47 INCH OD	80009	214-0604-00
-25	200-0728-00 ³			2						COV, HANDLE END:	80009	200-0728-00
-26	367-0116-00 ³			1						HANDLE, CARRYING: (ATTACHING PARTS)	80009	367-0116-00
-27	212-0597-00 ³			4						SCREW, MACHINE: 10-32 X 0.50 INCH, STL	80009	212-0597-00
-28	386-1624-00 ³			2						PL, RET., HANDLE:	80009	386-1624-00
-29	386-1283-00 ³			2						PLATE, HDL MTG: PLASTIC - - - * - - -	80009	386-1283-00
-30	200-1661-00 ¹			1						RTNR, CRT SCALE:	80009	200-1661-00
	200-1661-02 ²			1						RTNR, CRT SCALE: (ATTACHING PARTS)	80009	200-1661-02
-31	211-0188-00			2						SCREW, MACHINE: 4-40 X 0.30 INCH, SST - - - * - - -	80009	211-0188-00
-32	337-1674-06			1						SHLD, ELCTRN TUB: CRT	80009	337-1674-06
-33	386-2340-00			4						SUPPORT, CRT:	80009	386-2340-00
-34	386-2899-00			1						SUPPORT, CRT: FRONT	80009	386-2899-00
-35	384-1270-00			1						EXTENSION SHAFT: POWER SWITCH ON	80009	384-1270-00
-36	385-0033-00			1						INS, STANDOFF: 0.625 INCH LONG, NYLON (ATTACHING PARTS)	80009	385-0033-00
-37	211-0538-00			1						SCREW, MACHINE: 6-32 X 0.312 INCH, 100 DEG, FLH STL - - - * - - -	83385	OBD
-38	376-0127-00			1						COUPLER, SHAFT: PLASTIC	80009	376-0127-00
-39	358-0216-00			1						BUSHING, PLASTIC: 0.257 ID X 0.412 INCH OD	80009	358-0216-00
-40	366-1023-01			1						KNOB: GRAY	80009	366-1023-01

¹Remove for Option 6.²Option 6 only.³Remove for Option 3 and 7.⁴Option 3 only.

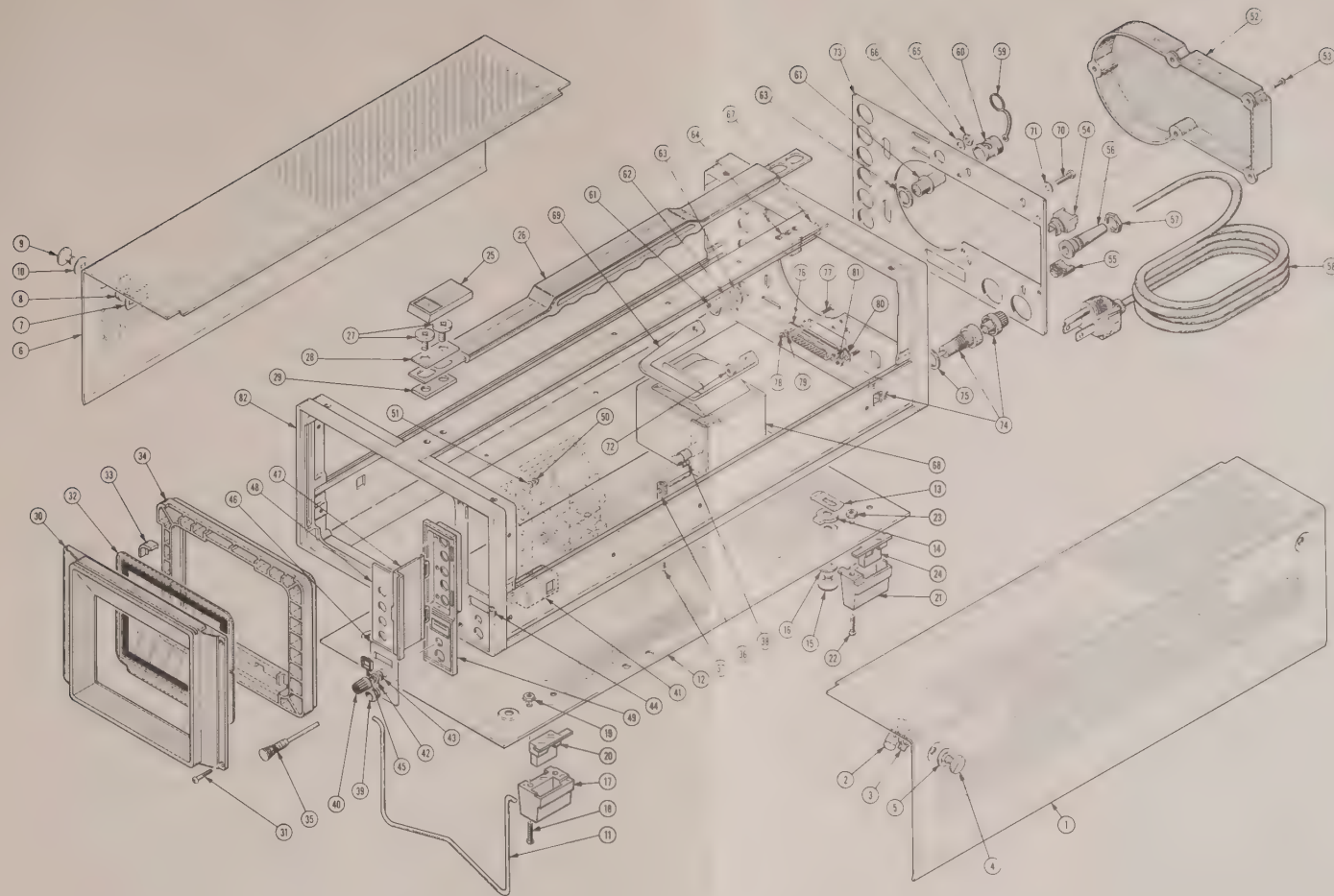
Replaceable Mechanical Parts—607

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Qty	1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
1-	213-0246-00		1		SETSCREW:5-40 X 0.093 INCH L,HEX SOC	71159	OBD
-41	-----		1		RESISTOR,VAR:(SEE R895 EPL) (ATTACHING PARTS)		
-42	210-0583-00		1		NUT,PLAIN,HEX.:0.25-32 X 0.312 INCH,BRS	73743	2X20224-402
-43	210-0940-00		1		WASHER,FLAT:0.25 ID X 0.375 INCH OD,STL	79807	OBD
-44	210-0046-00		1		WASHER,LOCK:INTL,0.26 ID X 0.40" OD,STL - - - * - - -	78189	1214-05-00-0541C
-45	426-0681-00		2		FR,PUSH BUTTON:GRAY PLASTIC	80009	426-0681-00
-46	333-1876-01		1		PANEL,FRONT:	80009	333-1876-01
-47	200-1282-00		1		DOOR,ACCESS:	80009	200-1282-00
-48	333-1875-00 ¹		1		PANEL,FRONT:	80009	333-1875-00
-49	386-2067-00		1		SUBPANEL,FRONT: (ATTACHING PARTS)	80009	386-2067-00
-50	210-0406-00		3		NUT,PLAIN,HEX.:4-40 X 0.188 INCH,BRS	73743	2X12161-402
-51	210-0054-00		3		WASHER,LOCK:SPLIT,0.118 ID X 0.212"OD STL - - - * - - -	83385	OBD
-52	200-1308-00 ²		1		COVER,CRT,REAR:	80009	200-1308-00
	200-1308-01 ³		1		COVER,CRT,REAR: (ATTACHING PARTS)	80009	200-1308-01
-53	211-0097-00		5		SCREW,MACHINE:4-40 X 0.312 INCH,PNH STL - - - * - - -	83385	OBD
-54	358-0515-00 ²		1		BSHG,STRAIN RLF:TOP	80009	358-0515-00
-55	358-0516-00 ²		1		BSHG,STRAIN RLF:BOTTOM	80009	358-0516-00
-56	200-1646-00 ²		1		CABLE NIP,PWR,:1.500 X 0.625 ID,W/FLANGE	80009	200-1646-00
-57	214-2038-00 ²		1		IND,LINE V:	80009	214-2038-00
	334-2551-00 ³		1		MARKER,IDENT:MKD WARNING POWER PLUG	80009	334-2551-00
	358-0529-00 ³		1		BSHG,STRAIN RLF:FOR 0.3-0.36 OD CABLE STR	28520	SR-6034
-58	161-0033-12 ²		1		CABLE ASSY,PWR:3,18AWG,125V,92.0 L	80009	161-0033-12
	161-0106-00 ³		1		CABLE ASSY,PWR:3,18 AWG,115V,70.0 L	80009	161-0106-00
-59	346-0045-00		3		STRAP,CONN COV:	80009	346-0045-00
-60	200-0991-00		3		COVER,ELEC CONN:	80009	200-0991-00
-61	-----		6		CONN,RCPT,: (SEE J200,300,400,500,600,650 EPL)		
-62	210-0255-00		6		TERMINAL,LUG:0.391" ID INT TOOTH	80009	210-0255-00
-63	342-0117-00		12		INSULATOR,BSHG:BNC	80009	342-0117-00
-64	-----		1		RESISTOR,VAR:(SEE R145 EPL) (ATTACHING PARTS)		
-65	210-0583-00		1		NUT,PLAIN,HEX.:0.25-32 X 0.312 INCH,BRS	73743	2X20224-402
-66	210-0940-00		1		WASHER,FLAT:0.25 ID X 0.375 INCH OD,STL	79807	OBD
-67	210-0046-00		1		WASHER,LOCK:INTL,0.26 ID X 0.40" OD,STL - - - * - - -	78189	1214-05-00-0541C
-68	-----		1		TRANSFORMER:(SEE T15 EPL)		
-69	343-0267-00		2		BRACKET,XFMR: (ATTACHING PARTS)	80009	343-0267-00
-70	212-0100-00		4		SCREW,MACHINE:8-32 X 0.625 INCH,HEX.HD,STL	83385	OBD
-71	210-0804-00		4		WASHER,FLAT:0.17 ID X 0.375 INCH OD,STL	12327	OBD
-72	210-0458-00		4		NUT,PLAIN,EXT W:8-32 X 0.344 INCH,STL - - - * - - -	83385	OBD
-73	333-1829-00 ²		1		PANEL,REAR:OPTION 6	80009	333-1829-00
	333-1829-01 ³		1		PANEL,REAR:	80009	333-1829-01
-74	352-0076-00		1		FUSEHOLDER:W/HARDWARE	75915	342012
-75	210-0873-00		1		WASHER,NONMETAL:0.5 ID X 0.688 INCH OD,NPRN	70485	OBD
-76	-----		1		CONTACT,ELEC:(SEE J20 EPL) (ATTACHING PARTS)		
-77	211-0101-00		2		SCREW,MACHINE:4-40 X 0.25" 100 DEG,FLH STL	83385	OBD
-78	210-0406-00		2		NUT,PLAIN,HEX.:4-40 X 0.188 INCH,BRS	73743	2X12161-402
-79	210-0004-00		2		WASHER,LOCK:INTL,0.12 ID X 0.26"OD,STL - - - * - - -	78189	1204-00-00-0541C
-80	210-0201-00		1		TERMINAL,LUG:SE #4 (ATTACHING PARTS)	78189	2104-04-00-2520N
-81	210-0586-00		1		NUT,PLAIN,EXT W:4-40 X 0.25 INCH,STL - - - * - - -	78189	OBD
-82	426-1111-00 ²		1		FRAME ASSY,MON:	80009	426-1111-00
	426-1301-00 ³		1		FRAME, MONITOR:	80009	426-1301-00

¹Remove for Option 4.

²Remove for Option 6

³Option 6 only.



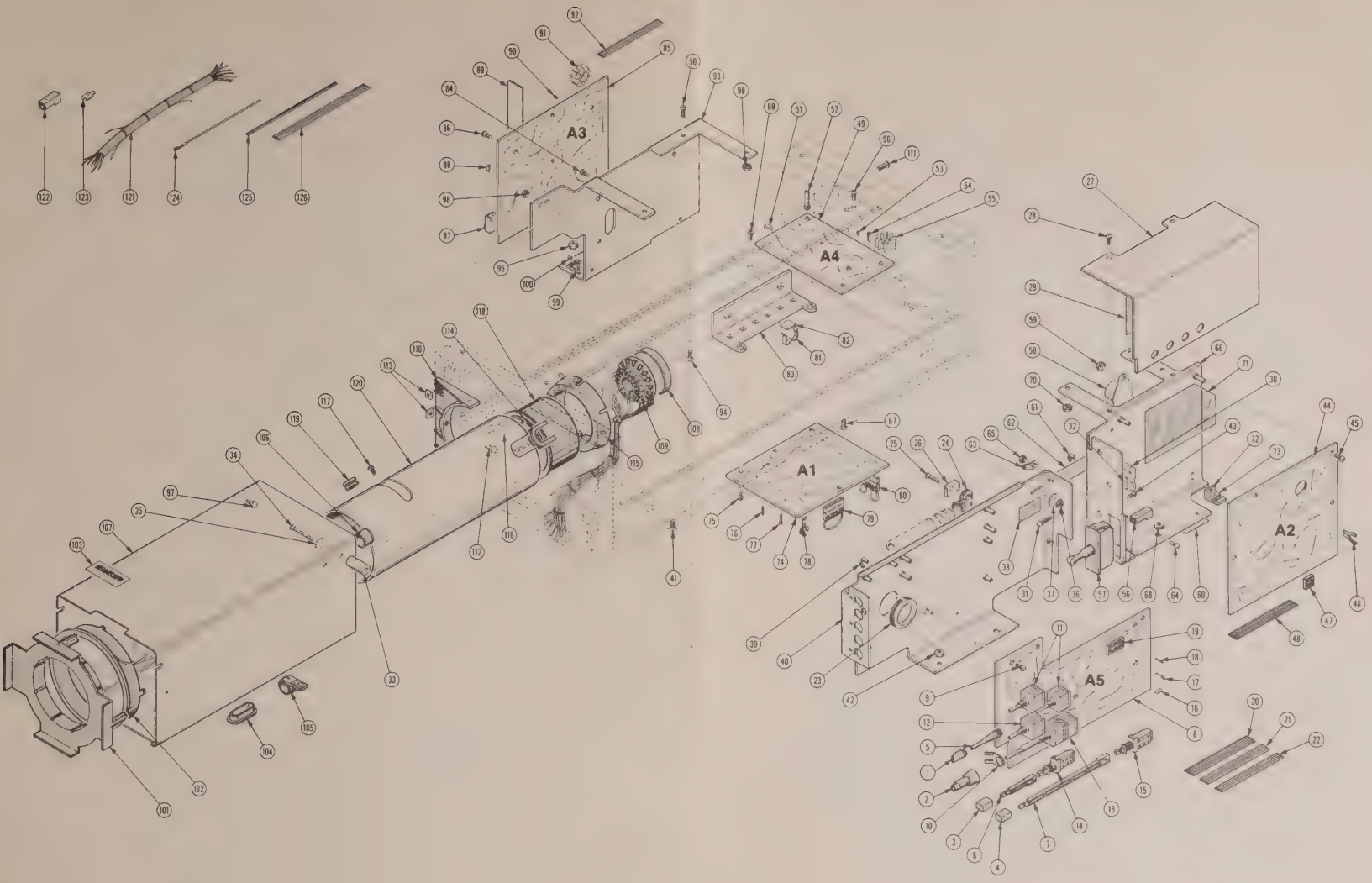


Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Qty	1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
2-1	366-1432-00		3		KNOB:GRAY	80009	366-1432-00
-2	366-1369-00		1		KNOB:GRAY	80009	366-1369-00
	213-0153-00		1		. SETSCREW:5-40 X 0.125 INCH,HEX SOC STL	74445	0BD
-3	366-1257-84		1		PUSH BUTTON:GRAY--ERASE	80009	366-1257-84
-4	366-1257-85		1		PUSH BUTTON:GRAY--STORE	80009	366-1257-85
-5	384-1121-00		1		EXTENSION SHAFT:1.41 INCH LONG	80009	384-1121-00
-6	384-1099-00		1		EXTENSION SHAFT:PUSH BUTTON,1.54 INCH LONG	80009	384-1099-00
-7	384-1061-00		1		EXTENSION SHAFT:3.981 INCH LONG	80009	384-1061-00
-8	-----		1		CKT BOARD ASSY:STORAGE(SEE A5 EPL) (ATTACHING PARTS)		
-9	211-0008-00		6		SCREW,MACHINE:4-40 X 0.25 INCH,PNH STL	83385	0BD
	-----		-		. CKT BOARD ASSEMBLY INCLUDES:		
-10	131-1635-00		1		CONTACT,ELEC:GND	80009	131-1635-00
-11	-----		2		. RESISTOR,VAR:(SEE R240 AND R440 EPL)		
-12	-----		1		. RESISTOR,VAR:(SEE R970 EPL)		
-13	-----		1		. RESISTOR,VAR:(SEE R175 FPL)		
-14	-----		1		. SWITCH,PUSH:(SEE S870 EPL)		
-15	-----		1		. SWITCH,PUSH:(SEE S910 EPL)		
-16	131-0566-00		1		LINK,TERM.CONNE:0.086 DIA X 2.375 INCH L	0000C	L-2007-1
-17	214-0579-00		4		. TERM.,TEST PT:0.40 INCH LONG	80009	214-0579-00
-18	131-0608-00		18		CONTACT,ELEC:0.365 INCH LONG	22526	47357
-19	136-0269-02		4		. SOCKET,PLUG-IN:14 CONTACT,LOW CLEARANCE	01295	C931402
-20	175-0829-00		FT		. WIRE,ELECTRICAL:6 WIRE RIBBON,1.917 FT	83501	TEK-175-0829-00
-21	175-0828-00		FT		. WIRE,ELECTRICAL:5 WIRE RIBBON,0.833 FT	23499	TEK-175-0828-00
-22	175-0827-00		FT		. WIRE,ELECTRICAL:4 WIRE RIBBON,1.688 FT	08261	TEK-175-0827-00
-23	348-0051-00		1		GROMMET,RUBBER:0.938 INCH DIA	83907	1107
-24	343-0006-00		1		CLAMP,LOOP:0.50 INCH DIAMETER,PLSTC (ATTACHING PARTS)	95987	1-2-6B
-25	211-0114-00		1		SCREW,MACHINE:4-40 X 0.438 INCH,FLH STL	83385	0BD
	210-0994-00		1		WASHER,FLAT:0.125 ID X 0.25" OD,STL	83385	0BD
-26	210-0863-00		1		WSHR,LOOP CLAMP:FOR 0.50" WIDE CLAMP,STL - - - * - - -	95987	C191
-27	337-2006-00		1		SHLD,ELECTRICAL:HIGH VOLTAGE (ATTACHING PARTS)	80009	337-2006-00
-28	211-0008-00		2		SCREW,MACHINE:4-40 X 0.25 INCH,PNH STL - - - * - - -	83385	0BD
	-----		-		. SHIELD INCLUDES:		
-29	342-0264-00		1		INSULATION,FILM:HV	80009	342-0264-00
	342-0249-00		1		INSULATION,FILM:3.82 X 1.87 IN,POLYEST	80009	342-0249-00
-30	343-0521-00		1		CLAMP,XSTR:750 WIDE W(2)4-40 THD HOLE (ATTACHING PARTS)	80009	343-0521-00
-31	211-0014-00		1		SCREW,MACHINE:4-40 X 0.50 INCH,PNH STL - - - * - - -	83385	0BD
-32	342-0082-00		1		INSULATOR,PLATE:0.52 SQ X 0.015 INCH THK,AL	80009	342-0082-00
-33	384-0539-00		1		ROD,SPACER:0.375 X 0.750 INCH (ATTACHING PARTS)	80009	384-0539-00
-34	211-0231-00		1		SCREW,MACHINE:4-40 X 1.0 PNH SST	78189	0BD
-35	210-1001-00		1		WASHER,FLAT:0.119 ID X 0.375" OD,BRS	12360	0BD
-36	210-0586-00		1		NUT,PLAIN,EXT W:4-40 X 0.25 INCH,STL	78189	0BD
-37	210-0958-00		1		WASHER,FLAT:0.115 ID X 0.469 INCH OD,STL - - - * - - -	78471	0BD
-38	334-2360-00		1		MARKER,IDENT:WARNING	80009	334-2360-00
	334-2363-00		1		MARKER INDENT:WARNING,DANGER,HV	80009	334-2363-00
-39	343-0213-00		1		CLAMP,LOOP:PRESS MT,PLASTIC	80009	343-0213-00
-40	441-1224-00		1		CHAS,ELEC EQUIP:STORAGE (ATTACHING PARTS)	80009	441-1224-00
-41	211-0538-00		2		SCREW,MACHINE:6-32 X 0.312"100 DEG,FLH STL	83385	0BD
-42	210-0457-00		2		NUT,PLAIN,EXT W:6-32 X 0.312 INCH,STL	83385	0BD
-43	211-0008-00		2		SCREW,MACHINE:4-40 X 0.25 INCH,PNH STL - - - * - - -	83385	0BD
-44	-----		1		CKT BOARD ASSY:HIGH VOLTAGE(SEE A2 EPL) (ATTACHING PARTS)		
-45	211-0008-00		2		SCREW,MACHINE:4-40 X 0.25 INCH,PNH STL - - - * - - -	83385	0BL

Replaceable Mechanical Parts—607

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Qty	1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
2-	-----		-		. CKT BOARD ASSY INCLUDES:		
-46	344-0154-00		2		. CLIP,ELECTRICAL:FOR 0.25 INCH DIA FUSE	80009	344-0154-00
-47	136-0514-00		1		. SOCKET,PLUG-IN:MICROCIRCUIT,8 CONTACT	82647	C930802
-48	175-0830-00		FT		. WIRE,ELECTRICAL:7 WIRE RIBBON,0.417 FT	08261	TEK-175-0830-00
-49	-----		1		CKT BOARD ASSY:Z AXIS(SEE A4 EPL)		
					(ATTACHING PARTS)		
-50	211-0008-00		2		SCREW,MACHINE:4-40 X 0.25 INCH,PNH STL	83385	OBD
	-----				- - - * - - -		
-51	131-0566-00 ¹		-		. CKT BOARD ASSY INCLUDES:		
-52	351-0280-00		1		. LINK,TERM.CONNE:0.086 DIA X 2.375 INCH L	0000C	I-2007-1
-53	136-0252-04		2		. GUIDE-POST,LOCK:0.620 INCH LONG	80009	351-0280-00
-54	214-0579-00		6		. CONTACT,ELEC:0.188 INCH LONG	22526	75060
-55	214-1291-00		9		. TERM.,TEST PT:0.40 INCH LONG	80009	214-0579-00
-56	200-1075-00		2		. HEAT SINK,ELEC:XSTR,0.72 OD X 0.375"H	05820	207-AB
-57	-----		1		COVER,ELEC CONN:PLASTIC	00779	1-480435-0
-58	-----		1		SWITCH PP:(SEE S12 EPL)		
					(SEE S10 EPL)		
					(ATTACHING PARTS)		
-59	210-0586-00		2		NUT,PLAIN,EXT W:4-40 X 0.25 INCH,STL	78189	OBD
-60	334-2359-00		1		MARKER,IDENT:WARNING	80009	334-2359-00
	334-2360-00		1		MARKER,IDENT:WARNING	80009	334-2360-00
-61	343-0088-00		1		CLAMP,LOOP:0.062 INCH DIA	80009	343-0088-00
-62	351-0087-00		1		GUIDE,CKT CARD:4.75 INCH LONG,PLASTIC	80009	351-0087-00
-63	210-0201-00		1		TERMINAL,LUG:SE #4	78189	2104-04-00-2520N
					(ATTACHING PARTS)		
-64	211-0008-00		1		SCREW,MACHINE:4-40 X 0.25 INCH,PNH STL	83385	OBD
-65	210-0586-00		1		NUT,PLAIN,EXT W:4-40 X 0.25 INCH,STL	78189	OBD
					- - - * - - -		
-66	441-1223-00 ²		1		CHAS,ELEC EQUIP:HIGH VOLTAGE	80009	441-1223-00
	441-1327-00 ³		1		CHASSIS,MONITOR:HIGH VOLTAGE	80009	441-1327-00
					(ATTACHING PARTS)		
-67	211-0538-00		3		SCREW,MACHINE:6-32 X 0.312"100 DEG,FLH STL	83385	OBD
-68	210-0457-00		3		NUT,PLAIN,EXT W:6-32 X 0.312 INCH,STL	83385	OBD
-69	211-0025-00		1		SCREW,MACHINE:4-40 X 0.375 100 DEG,FLH STL	83385	OBD
	211-0114-00		1		SCREW,MACHINE:4-40 X 0.438 INCH,FLH STL	83385	OBD
-70	210-0586-00		2		NUT,PLAIN,EXT W:4-40 X 0.25 INCH,STL	78189	OBD
					- - - * - - -		
-71	342-0248-00		-		. CHASSIS INCLUDES:		
-72	344-0131-00		1		. INSULATION,FILM:3.23 X 2.23 IN,POLYEST	80009	342-0248-00
			2		. CLIP,SPG TENS:CIRCUIT BOARD MOUNTING	80009	344-0131-00
					(ATTACHING PARTS FOR EACH)		
-73	210-0659-01		1		. EYELET,METALLIC:0.121 OD X 0.156 INCH LONG	80009	210-0659-01
					- - - * - - -		
-74	-----		1		CKT BOARD ASSY:POWER SUPPLY(SEE A1 EPL)		
					(ATTACHING PARTS)		
-75	211-0008-00		2		SCREW,MACHINE:4-40 X 0.25 INCH,PNH STL	83385	OBD
					- - - * - - -		
-76	131-0608-00		-		. CKT BOARD ASSY INCLUDES:		
-77	214-0579-00		14		. CONTACT,ELEC:0.365 INCH LONG	22526	47357
-78	344-0154-00		5		. TERM.,TEST PT:0.40 INCH LONG	80009	214-0579-00
-79	131-1895-00		2		. CLIP,ELECTRICAL:FOR 0.25 INCH DIA FUSE	80009	344-0154-00
	352-0166-02		1		. LINK,TERM CONNE:8,22 AWG,1.5 L	80009	131-1895-00
	131-0707-00		1		. . CONN BODY,PL,EL:8 WIRE RED	80009	352-0166-02
-80	131-1896-00		2		. . CONTACT,ELEC:0.48"L,22-26 AWG WIRE	22526	47439
	352-0166-01		1		. LINK,TERM CONNE:8,22 AWG,1.5 L	80009	131-1896-00
	131-0707-00		1		. . CONN BODY,PL,EL:8 WIRE BROWN	80009	352-0166-01
-81	344-0236-00		4		. . CONTACT,ELEC:0.48"L,22-26 AWG WIRE	22526	47439
-82	342-0082-00		3		CLIP,SPG TENS:	80009	344-0236-00
-83	407-1498-00		3		INSULATOR,PLATE:0.52 SQ X 0.015 INCH THK,AL	80009	342-0082-00
			1		BRACKET,ANGLE:	80009	407-1498-00
					(ATTACHING PARTS)		
-84	211-0008-00		2		SCREW,MACHINE:4-40 X 0.25 INCH,PNH STL	83385	OBD
					- - - * - - -		

¹Remove for Option 4.

²Remove for Option 6.

³Option 6 only.

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Qty	1 2 3 4 5					Name & Description	Mfr Code	Mfr Part Number	
2-85	-----		1						CKT BOARD ASSY:DEFLECTION(SEE A3 EPL) (ATTACHING PARTS)			
-86	211-0008-00		2						SCREW,MACHINE:4-40 X 0.25 INCH,PNH STL	83385	OB	D
	-----		-						CKT BOARD ASSY INCLUDES:			
-87	-----		4						SWITCH,SLIDE:(SEE S200,S300,S400 AND S500 EPL)			
-88	131-0566-00	1	2						LINK,TERM.CONNE:0.086 DIA X 2.375 INCH L	0000C	L-2007-1	
-89	337-1995-00		1						SHIELD,ELEC:DEFLECTION CIRCUIT BOARD	80009	337-1995-00	
-90	136-0252-04		12						CONTACT,ELEC:0.188 INCH LONG	22526	75060	
-91	214-1291-00		1						HEAT SINK,ELEC:XSTR,0.72 OD X 0.375"H	05820	207-AB	
-92	175-0827-00		FT						WIRE,ELECTRICAL:4 WIRE RIBBON,1.250 FT	08261	TEK-175-0827-00	
	334-2361-00		1						MARKER,IDENT:WARNING UP TO 80V ON THIS BOARD	80009	334-2361-00	
	348-0233-00	2	1						GROMMET,PLASTIC:GRAY,OVAL SHAPE, 0.927 ID	80009	348-0233-00	
-93	441-1222-00		1						CHAS,ELEC EQUIP:DEFLECTION (ATTACHING PARTS)	80009	441-1222-00	
-94	211-0538-00		2						SCREW,MACHINE:6-32 X 0.312"100 DEG,FLH STL	83385	OB	D
-95	210-0457-00		2						NUT,PLAIN,EXT W:6-32 X 0.312 INCH,STL	83385	OB	D
-96	211-0025-00		1						SCREW,MACHINE:4-40 X 0.375 100 DEG,FLH STL	83385	OB	D
-97	211-0116-00		1						SCR,ASSEM WSHR:4-40 X 0.312 INCH,PNH BRS	83385	OB	D
-98	210-0586-00		2						NUT,PLAIN,EXT W:4-40 X 0.25 INCH,STL	78189	OB	D
	-----		-						CHASSIS ASSY INCLUDES:			
-99	344-0133-00		2						CLIP,SPR,TNSN:CIRCUIT BOARD MOUNTING (ATTACHING PARTS)	80009	344-0133-00	
-100	210-0659-01		1						EYELET,METALLIC:0.121 OD X 0.156 INCH LONG	80009	210-0659-01	
-101	386-2876-00		1						SUPPORT,CRT:CENTER	80009	386-2876-00	
-102	-----		1						COIL,TUBE DEFL:(SEE L145 EPL)			
-103	334-1379-00		1						LABEL:CRT,ADHESIVE BACK	80009	334-1379-00	
	334-1951-00		1						MARKER,IDENT:MARKED WARNING	80009	334-1951-00	
-104	348-0253-00		1						GROMMET,PLASTIC:1.24 X 0.739 X 0.108" OA	80009	348-0253-00	
-105	343-0298-00		1						CLAMP,LOOP:PLASTIC,W/ADHESIVE BACK	95937	HPC25	
-106	348-0064-00		1						GROMMET,PLASTIC:0.625 INCH DIA	80009	348-0064-00	
-107	337-2081-00		1						SHIELD,CRT:FRONT	80009	337-2081-00	
-108	200-0616-01		1						COV,ELECTRON TU:	80009	200-0616-01	
-109	136-0596-00		1						SOCKET,PLUG-IN:CRT,WIRED	80009	136-0596-00	
	136-0301-01		1						SOCKET,PLUG-IN:	80009	136-0301-01	
-110	407-1128-00		1						BRKT,CRT SHIELD:REAR (ATTACHING PARTS)	80009	407-1128-00	
-111	211-0507-00		2						SCREW,MACHINE:6-32 X 0.312 INCH,PNH STL	83385	OB	D
-112	211-0589-00		1						SCREW,MACHINE:6-32 X 0.312 INCH,PNH BRS	83385	OB	D
-113	220-0419-00		3						NUT,PLAIN,SQ:6-32 X 0.312 INCH,STL	83385	OB	D
-114	348-0145-00		1						GROMMET,PLASTIC:U-SHP,1.0 X 0.42 INCH	80009	348-0145-00	
-115	386-2246-00		1						SUPPORT,CRT:REAR	80009	386-2246-00	
-116	343-0217-00		1						CLAMP,COIL:Y-AXIS (ATTACHING PARTS)	80009	343-0217-00	
-117	211-0147-00		2						SCREW,MACHINE:4-40 X 0.25 INCH,PNH STL	83385	OB	D
-118	-----		1						COIL,TUBE DEFL:(SEE L172 EPL)			
-119	348-0004-00		1						GROMMET,RUBBER:0.281 ID X 0.563 INCH OD	70485	763	
-120	337-1986-00		1						SHLD,ELCTR N TUB:REAR	80009	337-1986-00	
	334-2361-00		1						MARKER,IDENT:WARNING UP TO 80V ON THIS BOARD	80009	334-2361-00	
-121	179-2163-00		1						WIRING HARNESS:POWER	80009	179-2163-00	
-122	200-1075-00		3						COVER,ELEC CONN:PLASTIC	00779	1-480435-0	
-123	131-0861-00		3						CONTACT,ELEC:QUICK DISCONNECT	00779	42617-2	
-124	195-0165-00		1						LEAD SET,ELEC:CRT DEFLECTION	80009	195-0165-00	
	131-1538-00		4						CONTACT,ELEC:CRIMP-ON,22-26 AWG WIRE	22526	75369-002	
-125	175-0825-00		FT						WIRE,ELECTRICAL:2 WIRE RIBBON,0.334 FT	23499	TEK-175-0825-00	
-126	175-0828-00		FT						WIRE,ELECTRICAL:5 WIRE RIBBON,0.417 FT	23499	TEK-175-0828-00	

1 Remove for Option 4.

2 Option 6 only.

STANDARD ACCESSORIES

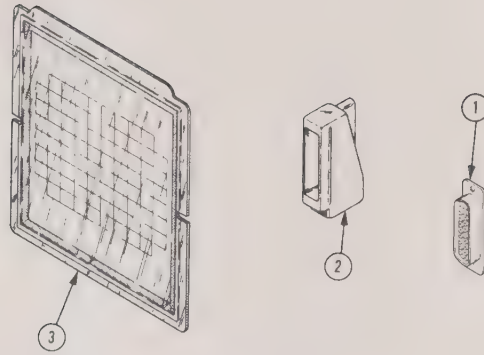


Fig. &
Index
No.

Tektronix Serial/Model No.
Part No. Eff Dscont

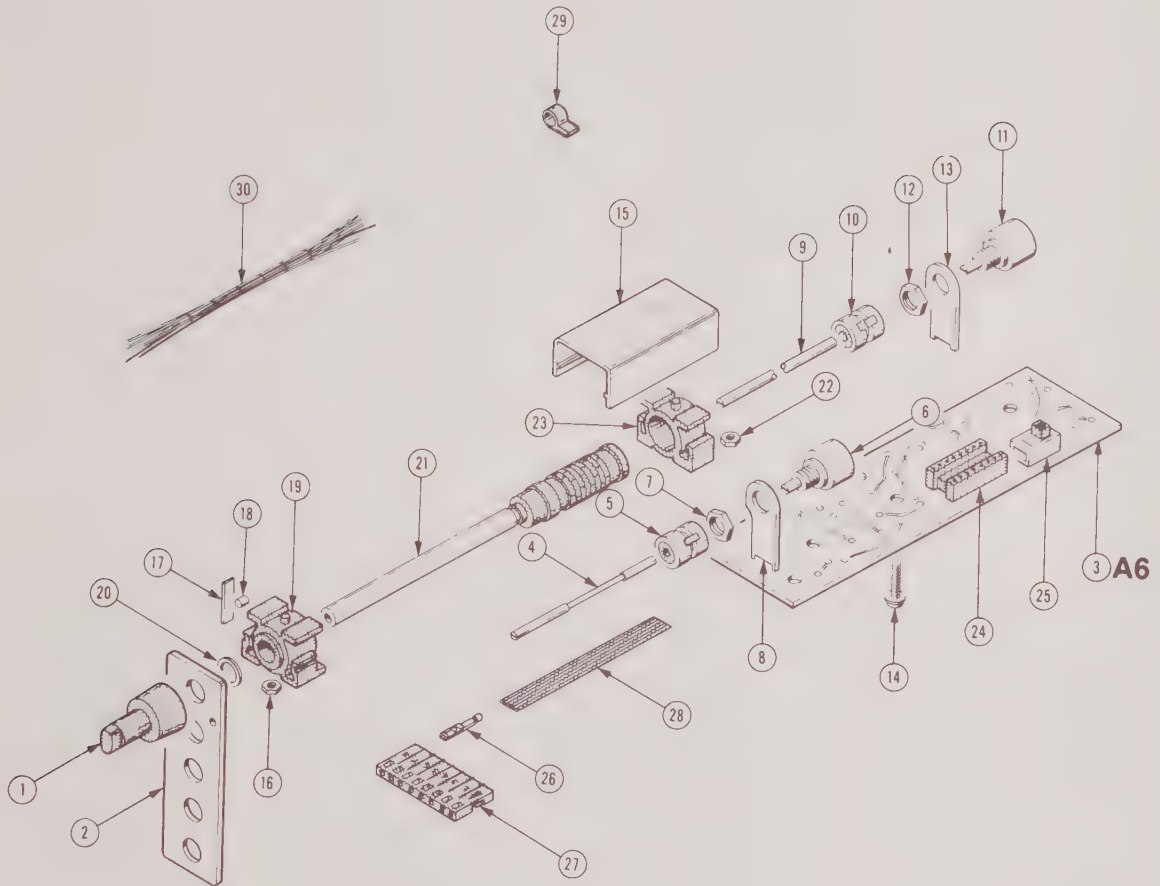
Qty 1 2 3 4 5

Name & Description

Mfr
Code Mfr Part Number

3-	070-2090-00		1	MANUAL, TECH: OPERATORS	80009	070-2090-00
	070-2091-00		1	MANUAL, TECH: INSTRUCTION	80009	070-2091-00
-1	131-0570-00		1	CONNECTOR, RCPT: 25 PIN, MALE	71468	DB25P
-2	200-0821-00		1	COV, ELEC CONN: 25 PIN	09133	DB-51213-1
-3	331-0391-00		1	SCALE, CRT:	80009	331-0391-00

Option 4



Option 4

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Qty	1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
-1	366-1369-00		1		KNOB:GRAY	80009	366-1369-00
	213-0153-00		2		. SETSCREW:5-40 X 0.125 INCH,HEX SOC STL	74445	OBD
-2	333-2001-00		1		PANEL,FRONT:SWP OPTION 4	80009	333-2001-00
-3	-----		1		CKT BOARD ASSY:SWEEP(SEE A6 EPL) (ATTACHING PARTS)		
	211-0008-00		4		SCREW,MACHINE:4-40 X 0.25 INCH,PNH STL	83385	OBD
	-----		-		. CKT BOARD ASSY:INCLUDES:		
-4	384-1156-00		1		. EXTENSION SHAFT:2.20 INCH LONG	80009	384-1156-00
-5	376-0051-00		1		. CPLG,SHAFT,FLEX:FOR 0.125 INCH DIA SHAFTS	80009	376-0051-00
	213-0022-00		1		. SETSCREW:4-40 X 0.188 INCH,HEX SOC STL	74445	OBD
-6	-----		1		. RESISTOR,VAR:(SEE R918 EPL) (ATTACHING PARTS)		
-7	210-0583-00		1		. NUT,PLAIN,HEX.:0.25-32 X 0.312 INCH,BRS	73743	2X20224-402
	210-0590-00		1		. NUT,PLAIN,HEX.:0.375 X 0.438 INCH,STL	73743	2X28269-402
			-		. PLATE,RES MTG:		
-8	386-2351-00		1		. EXTENSION SHAFT:5.688 INCH LONG	80009	386-2351-00
-9	384-0284-00		1		. CPLG,SHAFT,FLEX:FOR 0.125 INCH DIA SHAFTS	80009	384-0284-00
-10	376-0051-00		1		. SETSCREW:4-40 X 0.125 INCH,HEX SOC STL	74445	OBD
	213-0048-00		4		. RESISTOR,VAR:(SEE R945 EPL) (ATTACHING PARTS)		
-11	-----		1		. NUT,PLAIN,HEX.:0.25-32 X 0.312 INCH,BRS	73743	2X20224-402
	210-0583-00		1		. NUT,PLAIN,HEX.:0.375 X 0.438 INCH,STL	73743	2X28269-402
	210-0590-00		-		. BRKT,VAR RES:		
-12	387-0794-00		1		. DRUM ASSY,CAM SW:(SEE S1130 EPL) (ATTACHING PARTS)	80009	387-0794-00
	-----		1		. SCR,ASSEM WSHR:4-40 X 0.312 INCH,PNH BRS	83385	OBD
-13	211-0116-00		4		. DRUM ASSEMBLY INCLUDES:		
	-----		-		. COVER,CAM SW.:7 ELEMENTS	80009	200-1441-00
-14	200-1441-00		1		. NUT,PLAIN,HEX.:4-40 X 0.188 INCH,BRS	73743	2X12161-402
-15	210-0406-00		2		. SPRING,FLAT:CAM SW DETENT,0.008 INCH THICK	80009	214-1704-01
-16	214-1704-01		2		. ROLLER,DETENT:0.125 DIA X 0.125 INCH L	80009	214-1127-00
-17	214-1127-00		2		. BEARING,CAM SW:FRONT (ATTACHING PARTS)	80009	401-0155-00
-18	401-0155-00		1		. RING,RETAINING:FOR 0.25 INCH SHAFT	79136	5103-25-MD-R
-19	354-0219-00		1		. DRUM CAM SWITCH:TIMING	80009	105-0388-00
-20	105-0388-00		2		. NUT,PLAIN,HEX.:4-40 X 0.188 INCH,BRS	73743	2X12161-402
-21	210-0406-00		1		. BEARING,CAM SW:REAR	80009	401-0156-00
-22	401-0156-00		1		. SOCKET,PLUG-IN:16 CONTACT,RECT SHAPE	71785	133-51-02-075
-23	136-0260-01		1		. SWITCH,SLIDE:(SEE S1109 EPL)		
-24	-----		6		. CONTACT,ELEC:0.48"L,22-26 AWG WIRE	22526	47439
-25	131-0707-00		1		. CONN BODY,PL,EL:8 WIRE GREEN	80009	352-0166-05
-26	352-0166-05		FT		. WIRE,ELECTRICAL:5 WIRE RIBBON	23499	TEK-175-0828-00
-27	175-0828-00		1		. CLAMP,LOOP:PLASTIC,W/ADHESIVE BACK	95937	HPC25
-28	343-0298-00		1		. WIRING HARNESS:COAX	80009	179-1739-00
-29	179-1739-00						

MANUAL CHANGE INFORMATION

At Tektronix, we continually strive to keep up with latest electronic developments by adding circuit and component improvements to our instruments as soon as they are developed and tested.

Sometimes, due to printing and shipping requirements, we can't get these changes immediately into printed manuals. Hence, your manual may contain new change information on following pages.

A single change may affect several sections. Since the change information sheets are carried in the manual until all changes are permanently entered, some duplication may occur. If no such change pages appear following this page, your manual is correct as printed.

SERVICE NOTE

Because of the universal parts procurement problem, some electrical parts in your instrument may be different from those described in the Replaceable Electrical Parts List. The parts used will in no way alter or compromise the performance or reliability of this instrument. They are installed when necessary to ensure prompt delivery to the customer. Order replacement parts from the Replaceable Electrical Parts List.

CALIBRATION TEST EQUIPMENT REPLACEMENT

Calibration Test Equipment Chart

This chart compares TM 500 product performance to that of older Tektronix equipment. Only those characteristics where significant specification differences occur, are listed. In some cases the new instrument may not be a total functional replacement. Additional support instrumentation may be needed or a change in calibration procedure may be necessary.

Comparison of Main Characteristics

DM 501 replaces 7D13		
PG 501 replaces 107	PG 501 - Risettime less than 3.5 ns into 50 Ω .	107 - Risettime less than 3.0 ns into 50 Ω .
108	PG 501 - 5 V output pulse; 3.5 ns Risettime.	108 - 10 V output pulse; 1 ns Risettime.
111	PG 501 - Risettime less than 3.5 ns; 8 ns Pretrigger pulse delay.	111 - Risettime 0.5 ns; 30 to 250 ns Pretrigger Pulse delay.
114	PG 501 - ± 5 V output.	114 - ± 10 V output. Short proof output.
115	PG 501 - Does not have Paired, Burst, Gated, or Delayed pulse mode; ± 5 V dc Offset. Has ± 5 V output.	115 - Paired, Burst, Gated, and Delayed pulse mode; ± 10 V output. Short-proof output.
PG 502 replaces 107		
108	PG 502 - 5 V output	108 - 10 V output.
111	PG 502 - Risettime less than 1 ns; 10 ns Pretrigger pulse delay.	111 - Risettime 0.5 ns; 30 to 250 ns Pretrigger pulse delay.
114	PG 502 - ± 5 V output	114 - ± 10 V output. Short proof output.
115	PG 502 - Does not have Paired, Burst, Gated, Delayed & Undelayed pulse mode; Has ± 5 V output.	115 - Paired, Burst, Gated, Delayed & Undelayed pulse mode; ± 10 V output. Short-proof output.
2101	PG 502 - Does not have Paired or Delayed pulse. Has ± 5 V output.	2101 - Paired and Delayed pulse; 10 V output.
PG 506 replaces 106	PG 506 - Positive-going trigger output signal at least 1 V; High Amplitude output, 60 V.	106 - Positive and Negative-going trigger output signal, 50 ns and 1 V; High Amplitude output, 100 V.
067-0502-01	PG 506 - Does not have chopped feature.	0502-01 - Comparator output can be alternately chopped to a reference voltage.
SG 503 replaces 190, 190A, 190B	SG 503 - Amplitude range 5 mV to 5.5 V p-p.	190B - Amplitude range 40 mV to 10 V p-p.
191	SG 503 - Frequency range 250 kHz to 250 MHz.	191 - Frequency range 350 kHz to 100 MHz.
067-0532-01	SG 503 - Frequency range 250 kHz to 250 MHz.	0532-01 - Frequency range 65 MHz to 500 MHz.
TG 501 replaces 180, 180A	TG 501 - Marker outputs, 5 sec to 1 ns. Sinewave available at 5, 2, and 1 ns. Trigger output - slaved to marker output from 5 sec through 100 ns. One time-mark can be generated at a time.	180A - Marker outputs, 5 sec to 1 μ s. Sinewave available at 20, 10, and 2 ns. Trigger pulses 1, 10, 100 Hz; 1, 10, and 100 kHz. Multiple time-marks can be generated simultaneously.
181	TG 501 - Marker outputs, 5 sec to 1 ns. Sinewave available at 5, 2, and 1 ns.	181 - Marker outputs, 1, 10, 100, 1000, and 10,000 μ s, plus 10 ns sinewave.
184	TG 501 - Marker outputs, 5 sec to 1 ns. Sinewave available at 5, 2, and 1 ns. Trigger output - slaved to marker output from 5 sec through 100 ns. One time-mark can be generated at a time.	184 - Marker outputs, 5 sec to 2 ns. Sinewave available at 50, 20, 10, 5, and 2 ns. Separate trigger pulses of 1 and .1 sec; 10, 1, and .1 ms; 10 and 1 μ s. Marker amplifier provides positive or negative time marks of 25 V min. Marker intervals of 1 and .1 sec; 10, 1, and .1 ms; 10 and 1 μ s.
2901	TG 501 - Marker outputs, 5 sec to 1 ns. Sinewave available at 5, 2, and 1 ns. Trigger output - slaved to marker output from 5 sec through 100 ns. One time-mark can be generated at a time.	2901 - Marker outputs, 5 sec to 0.1 μ s. Sinewave available to 50, 10, and 5 ns. Separate trigger pulses, from 5 sec to 0.1 μ s. Multiple time-marks can be generated simultaneously.

NOTE: All TM 500 generator outputs are short-proof. All TM 500 plug-in instruments require TM 500-Series Power Module.

**TEKTRONIX®**committed to
technical excellence**MANUAL CHANGE INFORMATION**PRODUCT 607CHANGE REFERENCE C1/676EFF SN B010100-upDATE 6-17-76**CHANGE:****DESCRIPTION**

070-2091-00

ELECTRICAL PARTS LIST AND SCHEMATIC CHANGES

CHANGE TO:

C164 283-0057-00 CAP.,FXD,CER DI:0.1UF,+80-20%,200V

R164 315-0163-00 RES.,FXD,CMPSN:16K OHM,5%,0.25W

C164 and R164 are located on the HIGH VOLTAGE POWER SUPPLY board and are shown on diagram 4.

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MANUAL CHANGE INFORMATION

PRODUCT 607
EFF SN B010100-upCHANGE REFERENCE C2/776
DATE 7-6-76

CHANGE:

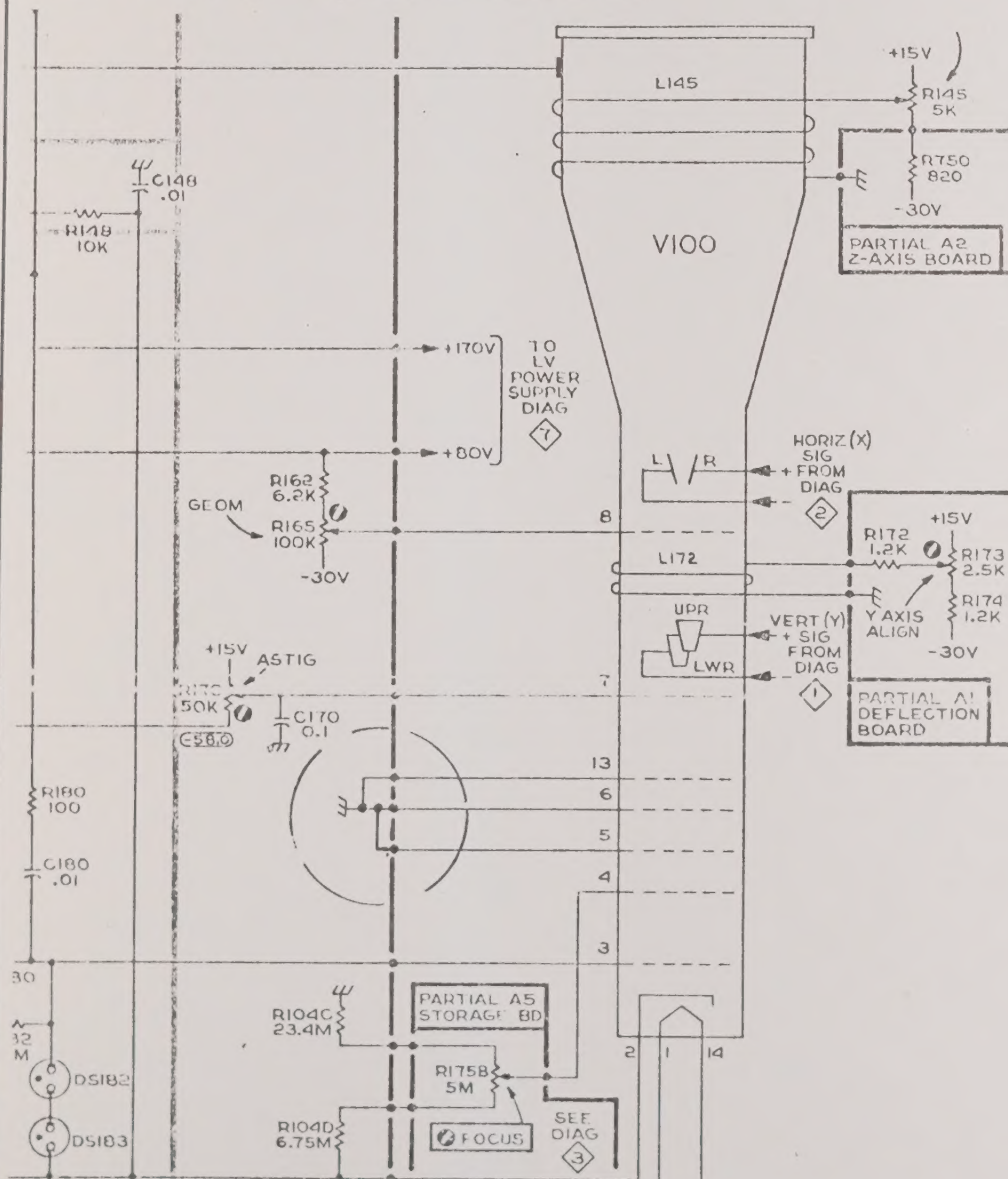
DESCRIPTION

070-2091-00

SCHEMATIC CORRECTION

DIAGRAM 4 HIGH VOLTAGE POWER SUPPLY - Partial

Pin 5 should go to ground as shown below.



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